

ResearchOnline@ND

University of Notre Dame Australia
ResearchOnline@ND

Theses

2011

Extra Food Intake and Depressive Symptoms in Adolescents: Is there a relationship?

Elizabeth Bradshaw
University of Notre Dame Australia

Follow this and additional works at: <http://researchonline.nd.edu.au/theses>



Part of the [Life Sciences Commons](#), and the [Medicine and Health Sciences Commons](#)

COMMONWEALTH OF AUSTRALIA
Copyright Regulations 1969

WARNING

The material in this communication may be subject to copyright under the Act. Any further copying or communication of this material by you may be the subject of copyright protection under the Act.

Do not remove this notice.

Publication Details

Bradshaw, E. (2011). Extra Food Intake and Depressive Symptoms in Adolescents: Is there a relationship? (Master of Health Sciences (Thesis)). University of Notre Dame Australia. <http://researchonline.nd.edu.au/theses/55>

This dissertation/thesis is brought to you by ResearchOnline@ND. It has been accepted for inclusion in Theses by an authorized administrator of ResearchOnline@ND. For more information, please contact researchonline@nd.edu.au.



**EXTRA FOOD INTAKE AND DEPRESSIVE SYMPTOMS IN
ADOLESCENTS: IS THERE A RELATIONSHIP?**

Submitted by

Elisabeth Bradshaw

This thesis is submitted for the degree of Masters in Health Science of the University of Notre
Dame Australia, School of Health Sciences.

2011

Declaration of Authorship

This thesis is the candidate's own work and contains no material which has been accepted for the award of any degree or diploma in any other institution.

To the best of the candidates knowledge, the thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

Candidate's Name

Date

Abstract

This pilot study explored the potential role of food on young people's mental health. Specifically, the aim was to determine if a relationship exists between extra food intake and depressive symptoms in adolescents' age 12-17 years. It has been documented that mental health problems in young people result from a complex interaction of risk and protective factors. Eating behaviours and food intake has been investigated in early adolescence (age 10-14), however the specific contribution of extra food on depressive symptoms in mid adolescence has not been determined.

Extra food intake and depressive symptoms were collected from girls and boys in year 8 to 12 (age 12-17) at one middle socio-economic secondary school located in the Perth metropolitan area. Participants completed a daily food recall checklist each day in class from Monday to Thursday to collect extra food intake during the weekday and weekend. Extra food included take away, drinks, party food and snacks. For depressive symptoms, participants completed the Centre of Epidemiological- Depression Scale. Participants were asked to indicate how often in the previous week they had experienced the symptoms listed.

Non parametric tests found girls to have higher scores for depressive symptoms than boys. Girls had significantly higher depressive symptoms than boys in year 8 and 9, and the pattern of depressive symptoms for boys revealed a significant increase from years 9 to 10. Being female and in year 10 emerged as important risk factors to depressive symptoms. There were no significant gender or year differences for total extra food intake, however girls consumed significantly more take away, party food and snack food in year 8 and 9, but boys

consumed significantly more take away than girls in year 11 and 12. Significantly more servings of take away and drinks were consumed on the weekend compared to the weekday.

A linear mixed model analysis reported that the consumption of drinks was related to depressive symptoms. Specifically, cordial intake appeared as a significant contributor to higher level of depressive symptoms in girls and year 10 students. The interactions between other types of extra food and specific years also became significant to depressive symptoms. The consumption of take away and drinks on the weekend emerged as significant contributors to depressive symptoms.

This study identifies the potential role of food intake on mental health problems. Previous research has focused on the overall diet in adolescents age 10-14 and has identified that a diet high in processed food is linked with self reported depressive symptoms. The results of this study have revealed important interactions between different types of food and specific years beyond age 14. In particular the consumption of drinks in year 10 is associated with a higher level and severity of depressive symptoms. Another important finding was the pattern of depressive symptoms between boys and girls, with girls having significantly higher depressive symptoms in years 8 and 9, and boys showing a significant increase from years 9 to 10. These results have important implications for future research and practice, particularly in the content and timing of messages about healthy eating and in addressing the risk and protective factors interacting during this time.

Acknowledgements

I would like to acknowledge the following people for their contribution to this research project.

Firstly, to my supervisor Fiona Farrington. Thank you for encouraging me to embark on this project. It has been one of the most challenging but rewarding experiences I have ever had. Your passion for social research is truly admirable, and I am so appreciative of your advice and experience from your work with schools and young people. Thank you for your patience, enthusiasm and moral support throughout the entire research project and development of this thesis. Words cannot express how truly grateful I am.

To Max Bulsara, for helping me understand statistics. Thank you for your guidance throughout my research. Your assistance in the entry, treatment and analysis of my data is greatly appreciated.

To the staff within the School of Health Sciences, thank you for the constant laughs and words of encouragement throughout this research.

Sincere thanks to the students, parents, school nurse and teachers at the school involved in this study, for their time, cooperation and assistance. Without these people, this study could not have happened.

Finally, to my family and friends, for their love and support. Thank you for your constant source of strength and belief in me. I could not have done this without you.

Table of Contents

Abstract.....	ii
Acknowledgements.....	iv
List of Figures.....	xi
List of Tables	xii
Chapter One: Introduction	1
Background and Statement of Problem	1
Purpose of this Pilot Study.....	6
Significance.....	6
Conceptual Framework.....	7
Major Research Question:.....	10
Major hypotheses:.....	10
<i>Null hypothesis</i>	10
<i>Alternative hypotheses</i>	11
<i>Directional hypotheses</i>	11
<i>Variables</i>	11
Assumptions.....	12
Delimitations.....	12
Limitations	13
Definition of Terms.....	16

Chapter Two: Literature Review.....	19
Adolescence and Mental Health	19
The Prevalence of Mental Health Problems and Depression in Young People	20
Year Differences for Depression Symptoms in Young People.....	21
Gender Differences for Depression Symptoms in Young People.....	22
Protective factors on depressive symptoms	24
<i>Positive coping style</i>	24
<i>Spirituality</i>	25
<i>Family cohesion</i>	25
<i>Parental and Peer support</i>	26
<i>School environment</i>	26
<i>Food</i>	27
<i>Diet quality</i>	27
<i>Family meals</i>	28
<i>Breakfast habits</i>	29
Risk factors on Depressive Symptoms.....	30
<i>Depressed parents</i>	30
<i>Low socio economic status</i>	30
<i>Low perceived parental and peer support</i>	31
<i>Negative life events</i>	31
<i>Bullying</i>	32

<i>Negative thinking</i>	32
<i>Hazardous Behaviours</i>	33
<i>Alcohol</i>	33
<i>Cigarette smoking</i>	34
<i>Cannabis use</i>	34
<i>Unsafe sex</i>	35
<i>Suicidality</i>	36
<i>Adolescent eating behaviours</i>	37
<i>Food restriction</i>	37
<i>Fruit and vegetable intake</i>	38
<i>Family meals</i>	39
<i>Breakfast habits</i>	40
<i>Extra food intake in adolescents</i>	41
<i>Take away foods</i>	42
<i>Party food</i>	43
<i>Snack foods</i>	43
<i>Drinks</i>	44
<i>Influences on Adolescent Eating Behaviours</i>	45
<i>Socioeconomic status</i>	46
<i>Taste</i>	46
<i>Food availability and accessibility</i>	46

<i>Parental influences</i>	47
<i>Peer influences</i>	48
<i>Television viewing</i>	49
<i>Advertising</i>	49
Timing of Extra Food Intake.....	50
Links between Extra Food Intake and Depressive Symptoms	51
Methodological Issues	52
<i>Considerations for school based research</i>	52
<i>Active consent versus passive consent</i>	53
<i>Response rate</i>	53
<i>Sample bias</i>	57
Challenges of mental health research.....	58
<i>School settings</i>	58
<i>Active consent</i>	59
<i>Low response rate</i>	60
<i>Questioning of sensitive issues</i>	62
Assessment of dietary intake	63
<i>Food frequency questionnaires</i>	64
<i>Dietary history</i>	66
<i>Dietary record</i>	67
<i>24 hour recall</i>	68

<i>Daily food recall checklist</i>	69
Chapter 3: Methodology	74
Participants and Setting.....	74
Measures	75
<i>Daily food recall checklist</i>	75
<i>Centre for Epidemiologic Studies – Depression Scale (CES-D)</i>	77
Data Collection and Procedures.....	79
Treatment of Data	82
Data Analysis.....	82
Ethical Clearance	84
Chapter Four: Results	86
Response Rate.....	86
Depressive Symptoms.....	87
<i>Total score for depressive symptoms</i>	87
<i>Level of depressive symptoms (cut-off score)</i>	92
<i>Severity of depressive symptoms (minimal, mild, moderate & severe)</i>	92
Extra Food Intake.....	95
<i>Total extra food</i>	95
<i>Type of extra food</i>	96
Timing of Intake	100
<i>Timing of total extra food intake</i>	100

<i>Timing of intake for each type of extra food</i>	102
Depressive Symptoms and Extra Food Intake	103
Chapter Five: Discussion	105
Low Response Rate.....	105
Depressive Symptoms.....	106
<i>Year differences</i>	108
<i>Gender differences</i>	110
Extra Food Intake.....	113
<i>Year differences</i>	113
<i>Gender differences</i>	115
Timing of Intake	117
Extra Food Intake and Depressive symptoms	119
Chapter Six: Conclusion	122
Implications.....	124
<i>For future research</i>	124
<i>For practice</i>	126
Reference List	128
Appendix 1.....	150
Appendix 2.....	164
Appendix 3.....	165
Appendix 4.....	173

List of Figures

<i>Figure 1.</i> Conceptual framework for the current study	9
<i>Figure 2.</i> Mean depressive symptoms total score for girls and boys across each year group	88
<i>Figure 3.</i> Percentage of students categorised with minimal, mild, moderate and severe depressive symptoms for year 8 and 9, year 10, and year 11 and 12.	93
<i>Figure 4.</i> Percentage of students categorised with minimal, mild, moderate and severe depressive symptoms for boys and girls.....	94
<i>Figure 5.</i> Mean servings for total extra food intake for girls and boys across each group.....	95
<i>Figure 6.</i> Mean servings for each type of extra food for each year group.	97

List of Tables

Table 1. <i>Total participants by year and gender.....</i>	87
Table 2. <i>Median scores for CES-D for girls and boys across all year groups.....</i>	91
Table 3. <i>Median scores for each type of extra food for girls and boys across all year groups ...</i>	99
Table 4. <i>Mean values for extra food weekday versus weekend for girls and boys across all year groups.</i>	101
Table 5. <i>Mean values for type of extra food weekday versus weekend for girls and boys with all year groups combined</i>	102

Chapter One: Introduction

Background and Statement of Problem

An individual who is mentally healthy is in a complete state of physical, social and mental well being (World Health Organization, 2008). Mental health problems arise when an individual lacks the emotional and social well being to deal with everyday stressors, work productively and fruitfully, and contribute to the community (Raphael, 2000). Worldwide, 12.2-48.6% of adults will experience a mental disorder at some point in their life (World Health Organization, 2008). Approximately 20% of children and adolescents worldwide have a mental disorder, or related mental health problem and 50% of these commence before the child reaches 14 years of age (World Health Organization, 2009). Of the global burden due to disease, 14% is attributed to mental, neurological and substance disorders (World Health Organization, 2008). Mental disorders are associated with violence, unemployment, social exclusion and insecurity worldwide, and is a significant risk factor to non communicable disease, communicable diseases and unintentional and intentional injury, including suicide (World Health Organization, 2008).

Australian prevalence studies indicated almost 1 in 2 (46%) people aged 16-85 years had experienced a mental disorder at some point in their lives (Slade, Johnston, Teesson, Whiteford, Burgess, Pirkis et al., 2009). This equates to approximately 7.3 million Australians. The 2007 National Survey of Mental Health and Wellbeing revealed that in the 12 months prior to the survey, one in five Australians had experienced a mental disorder. Of these, 14% had an anxiety disorder, 6.2% had an affective disorder and 5.1% had a substance use disorder. This equates to 2.3 million suffering an anxiety disorder, 1 million an affective disorder and 800 000 a substance use disorder (Slade et al., 2009).

The same report revealed that young people (16-24 years) have the highest prevalence rate of mental disorders than any other age group (Slade et al., 2009). Just over one in four (26.4%) of young people had experienced a mental disorder compared with one in twenty (5.9%) in the oldest age group (75-85 years). Furthermore, more females than males experienced a mental disorder in every age bracket (Slade et al., 2009). A greater percentage of young females (14%) than young males (4%) experience an anxiety disorder, but more males (11%) than females (5%) experience a substance use disorder. Females are also more likely to experience a combination of anxiety and substance disorders than males (Slade et al., 2009).

A recent report titled *The Health and Well Being of Young Australians* identified that the mental health of young people has declined and the prevalence of mental disorders has increased over successive generations (Eckersley, 2007). For young people, mental disorders remain the greatest burden of disease and are the strongest predictor of suicide, the leading cause of death for people aged 15-24 years (Muir, Mullan, Powell, Flaxman, Thompson, & Griffiths, 2009). Mental disorders in young people appear to be detrimental to their quality of life, physical health, and emotional and social well being (Sawyer, Miller-Lewis, & Clark, 2007). Studies have found that young people with mental health problems often have lower self esteem, reduced school performance and may have emotional or behavioural difficulties when interacting with family and peers (Sawyer, 2000).

The reasons why mental disorders appear common in young people are complex. Understanding the interaction between protective and risk factors that occurs during adolescence is important because 75% of mental health problems in adults commence in childhood or adolescence (Muir et al., 2009). Adolescence is a time of significant physical, social and emotional change, including the onset of puberty, changes in academic and social demands from

the transition to high school and changing relationship with family and peers (Muir et al., 2009; Raphael, 2000). During this time, adolescents are searching for identity, purpose and belonging, and are adapting to an increase in independence and autonomy (Rowe, Bennett, & Tonge, 2009). In addition, adolescence appears to be a period of risk taking, and experimentation where hazardous behaviours may be common (Raphael, 2000).

Adolescence is also marked by a change in food intake patterns, including missing meals, snacking frequently and consuming a large amount of 'extra' food items (Savidge, Ball, Worsley, & Crawford, 2007). Extra food items are food and drink that do not fit within the five main 'core' food groups of The Australian Guide to Healthy Eating (AGHE), including vegetables and legumes, bread, cereals, rice, pasta and noodles, milk, yoghurt and cheese, lean meat, fish, poultry, eggs, nuts and legumes, and fruit (Smith, Kellet, & Schmerlaib, 1998). These food items are generally nutritionally poor and energy dense, and contain high amounts of fat, salt and/or sugar. Examples include biscuits, cakes, deserts, soft drinks, pies, pastries, sausage rolls, take away food, lollies and chocolate. Extra food items are not regarded as essential to good health and are recommended to be consumed occasionally and in small amounts. The recommended limit for extra food for adolescents age 12-18 years is 1-3 servings per day (Rangan, Randall, Hector, & Webb, 2008).

A majority of Australian young people consume extra food on a daily basis (Savidge et al., 2007), and most adolescents (age 12-18) consume it at a level two to four times above the recommended limit (1-3 serves per day) (Rangan et al., 2008). This greater frequency of extra food appears to be positively associated with a higher intake of energy and fat (French, Story, Neumark-Sztainer, Fulkerson, & Hannan, 2001), and has been found to be a significant contributor to physical health, such as childhood and adolescent obesity (Tam, Garnett, Cowell,

Campbell, Cabrera, & Baur, 2006). The consumption of extra food is a growing concern, because as intake increases, the consumption of other healthier foods, such as fruit, vegetables and milk appears to decline (French et al., 2001; Harnack, Stang, & Story, 1999; Larson, Neumark-Sztainer, Harnack, Wall, Story, & Eisenberg, 2008).

Previous research has found links between some types of extra food and mental health. Lien, Lien, Heyerdahl, Thoresen and Bjertness (2006) conducted a study with over 7000 year 10 Norwegian students, and found that soft drink consumption has a strong association with mental health problems. Similarly, an Australian study involving adults found soft drink to be significantly related to depression, stress, suicidal ideation and psychological distress (Zumin, Taylor, Wittert, Goldney, & Gill, 2010). Emerging evidence also suggests the ingredients in energy drinks may contribute to mood and behaviour problems (Finnegan, 2003; Walker, Abraham, & Tercyak, 2010). Furthermore longitudinal research has linked extra food consumption at age four and a half years with greater odds of hyperactivity at age seven (Wiles, Northstone, Emmett, & Lewis, 2009).

Other research examined the role of eating habits on mental health. Jarvelaid (2008) found that breakfast skipping is associated with a greater symptomology of depression in a study of Estonian adolescents aged 15-17 years. Furthermore, it appears that eating a high quality breakfast reportedly reduces the odds of poor mental health status in early adolescence (O'Sullivan, Robinson, Kendall, Miller, Jacoby, Silburn et al., 2008). Similarly, regular meals with family members on most days of the week appears to be protective against depressive symptoms and other hazardous behaviours (Fulkerson, Story, Mellin, Leffert, Neumark-Sztainer, & French, 2006).

Another focus has been on the contribution of specific nutrients to depressive disorders. Omega 3 fatty acids appear to be more common in the diets of non-depressed individuals (Bamber, Stoke, & Stephen, 2007). Additionally, folic acid has been found to act as antidepressant (Coppen & Bailey, 2000). However, the focus on these studies was adult females and depressed patients. No significant differences in intake between depressed and non depressed individuals in community samples have been observed, suggesting more research is required in this area relating to children and adolescents (Jacka, Pasco, Henry, Kotowicz, Nicholson, & Berk, 2004).

Previous studies have also given attention to the overall diet quality and mental health outcomes. Longitudinal research has reported a link between a diet high in processed foods and a greater likelihood of depressive symptoms five years later in middle age women (Akbaraly, Brunner, Ferrie, Marmot, Kivimaki, & Singh-Manoux, 2009). The same study found that a diet rich in fruit, vegetables and fish is protective against depression. Similarly, other research found that a traditional diet (vegetables, fruit, beef, lamb, fish and whole grain foods) reduces the odds of depressive and anxiety disorders, and a 'western' diet comprised of unhealthy, processed foods is associated with greater odds of major depression or dysthymia (Jacka, Pasco, Mykletun, Williams, Hodge, O'Reilly et al., 2010). Given findings about the contribution of unhealthy foods has been documented in the context of the overall diet, more research is required into the specific role and absolute amount of 'extra' foods, and possible links with mental health and depressive symptoms (Jacka et al., 2010).

Oddy, Robinson, Ambrosini, O'Sullivan, De Klerk, Berlin and colleagues (2009) indicated that extra food is associated with social problems, withdrawal, anxious/depressed, attention problems, somatic problems, aggression and delinquency problems in adolescents age

14. This appeared to be the first evidence to suggest a possible relationship between extra food intake and depressive symptoms in adolescents. Jacka, Kremer, Leslie, Berk, Patton and Toumbourou et al (2010) replicated and extended these findings, reporting that increased odds of self reported symptoms of depression are associated with a greater consumption of unhealthy and processed foods in adolescents aged 10-14 years. Results indicated a dose response relationship between an unhealthy diet and a greater likelihood of depressive symptomology. The current study builds on these findings and investigated adolescents beyond age 14 to review the possible changes in intake during the entirety of adolescence (age 12 – 17 years). The impact of this on depressive symptoms in this age group and the difference for intake between the weekend and the school week was also investigated.

Purpose of this Pilot Study

The purpose of this study was to determine if a relationship exists between extra food intake and depressive symptoms in adolescents, in year 8 to 12. Specifically, the focus is to examine if there are any links between the extra food items that young people eat and drink, and their self-reported depressive symptoms. This study also examined differences in extra food intake and depressive symptoms between year groups, gender and weekday versus weekend intake. This study comprised students in grade eight (age 12) to twelve (age 17) in a Western Australian metropolitan government secondary school. They were asked to complete a daily recall food checklist in class for a week and a screening instrument for depressive symptoms.

Significance

Given the increase in the prevalence of mental health problems in teenagers, it is important to identify at what age there is an increase in depressive symptoms and if this differs between genders. In addition, it appears that patterns of extra food intake change as young

people progress through adolescence and it is important to identify when these extra food intake changes take place, and if this impacts on depressive symptoms. Therefore, this study investigated if a relationship exists between the consumption of extra food and depressive symptoms in adolescents.

Given schools are important settings for adolescent social and emotional well being, the findings in this study provides practical information for school educators, parents and students, regarding nutrition and depressive symptoms. Few studies have examined the link between mental health problems and the potentially damaging effect of consuming fast food, energy drinks and unhealthy snacks, which appear to be a dominant feature of adolescents' diets. The study provides insightful information that can support healthy nutrition interventions and possible changes to the canteen within a school setting

Furthermore, the study also provides valueable insight into the appropriate timing and delivery of health education regarding nutrition and mental health. The recommendations of the study provide school educators with the appropriate year levels to deliver nutrition and mental health education. In turn, the timing and delivery of health education related to nutrition and mental health would be become more targeted to match the needs of secondary school students at relevant times during adolescence.

Conceptual Framework

Previous research related to correlations between mental health and health compromising behaviours, such as unhealthy nutrition, has been guided by the Cognitive Behavioural Theory (CBT) (Beck, Rush, Shaw, & Emery, 1979), Social Cognitive Theory (SCT) (Bandura, 1986),

Theory of Planned Behaviour (TPB) (Ajzen, 1991) and the Problem Behaviour Theory (PBT) (Donovan & Jessor, 1985).

Most health related research has used cognitive constructs to guide their theoretical framework. The CBT is related to how a person's behaviour is determined by beliefs and perceptions about the world, which results in how they feel and act (Beck et al., 1979). Research that has used this theoretical framework examined the relationship between symptoms of depression and anxiety, with self esteem and the belief to engage in a healthy lifestyle, in overweight teenagers (Melnik, Small, Morrison-Beedy, Strasser, Kreipe, Jacobson et al., 2006).

SCT emphasizes the importance of socio-environmental factors on health behaviour (Bandura, 1986) Studies that have been guided by this theory have investigated the role of family meals on the self efficacy of adolescents to make healthy choices about the food they consumed (Neumark-Sztainer, Story, Ackard, Moe, & Perry, 2000). This has also been the theoretical framework to highlight the importance of behavioural, social and affective factors on fruit and vegetable intake in adolescents (Granner, Sargent, Calderon, Hussey, Evans, & Watkins, 2004). Other research has adapted this theory to guide a reciprocal relationship between a number of dynamic factors, including depressive symptoms, and adolescent fruit intake (Lytle, Varnell, Murray, Story, Perry, Birnbaum et al., 2003).

The TPB is based on the premise that the intention to perform a behaviour results from a combination of favourable attitudes from other people, the pressure to perform the behaviour and the perception of ease to which the behaviour can be performed (Ajzen, 1991). Previous research guided by this theory investigated the beliefs and attitudes towards sugar-free products in secondary school students (Messina, Saba, Vollono, Leclercq, & Piccinelli, 2004).

Alternatively, the PBT is based on the idea that a clustering of behaviours influences health and wellbeing (Donovan & Jessor, 1985). This theoretical framework guided research that examined the role between depressive symptoms and health compromising behaviours, such as eating behaviours and food intake (Fulkerson, Sherwood, Perry, Neumark-Sztainer, & Story, 2004). A cluster of health compromising behaviours is the strongest predictor of depressive symptoms.

The conceptual framework for this study incorporates components of SCT and PBT. The influence of individual, social and environmental factors in predicting extra food intake is emphasized in SCT and it is essential to acknowledge the role of these factors prior to investigating the possible relationship with depressive symptoms. Although not examined in the current study, the researcher acknowledges the influence of these on extra food intake in adolescents. Similarly, the framework acknowledges the role of protective and risk factors on the incidence of depressive symptoms in adolescents.

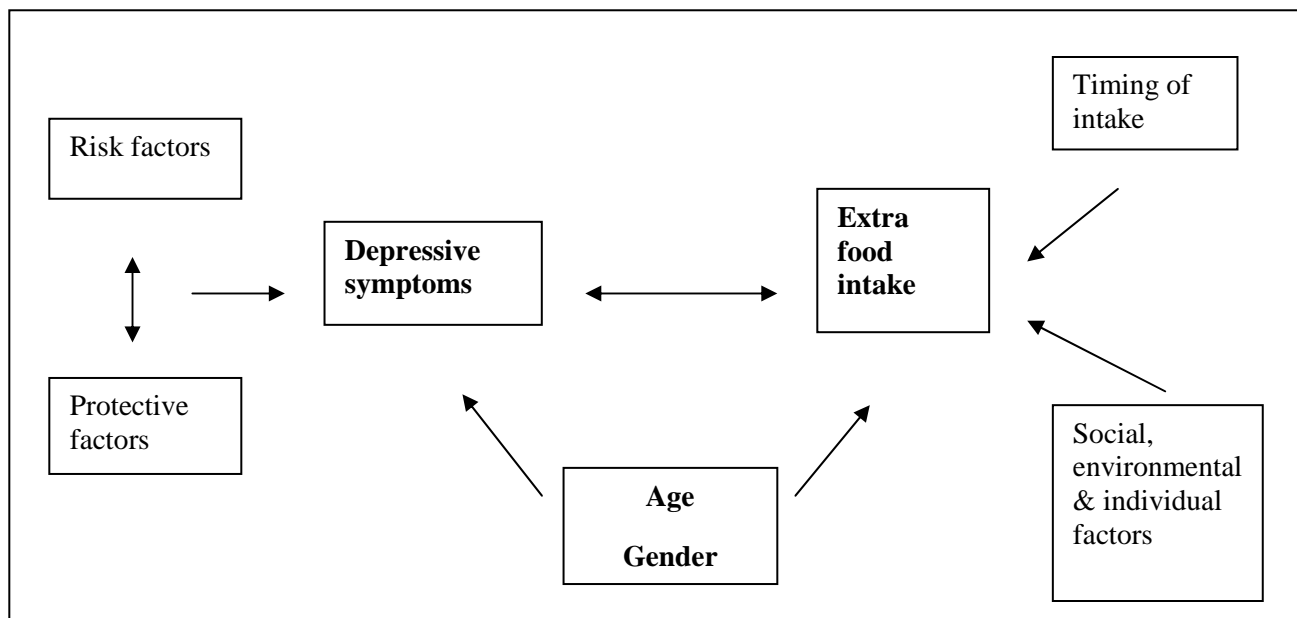


Figure 1. Conceptual framework for the current study

The conceptual framework of this study (Figure 1) guided research to determine if a relationship does exist between extra food intake and depressive symptoms in teenagers. The model allowed for gender and age, and the timing of extra food intake. The model also recognises the dynamic interaction of risk and protective factors for depressive symptoms, and considers the social, environmental and individual factors that influence the current intake of extra food by adolescents.

Major Research Question:

- Is there a relationship between extra food intake and self-reported depressive symptoms in teenagers?

In addressing the major research question the following questions were considered.

- Does intake of extra food differ by year?
- Does intake of extra food differ by gender?
- Does intake of extra food differ between weekday and weekend?
- Does the incidence of self-reported depressive symptoms differ by year?
- Does the incidence of self-reported depressive symptoms differ by gender?

Major hypotheses:

In addressing the main research questions, the following hypotheses were proposed.

Null hypothesis

- There will be no relationship between extra food intake and self reported depressive symptoms in adolescents.

Alternative hypotheses

- There will be a relationship between extra food intake and self reported depressive symptoms in adolescents.

Directional hypotheses

To test the major hypotheses, the following directional hypotheses were made:

- Older adolescents (age 15-17) will consume a greater amount of extra food than younger adolescents (age 13-15).
- Male adolescents will consume a greater amount of extra food than female adolescents
- A greater amount of extra food will be consumed on the weekend compared to the weekday
- Younger adolescents will report more self-reported depressive symptoms than older adolescents
- Female adolescents will report more self-reported depressive symptoms than male adolescents

Variables

Although this study tested if a relationship existed, it was assumed that food would be the independent variable, and depressive symptoms would be the dependent variable. There are also the following categorical variables for extra food and depressive symptoms. For extra food, the categorical variables were gender, year, weekday and weekend. For depressive symptoms, the categorical variables were gender, year, cut off score that delineates a higher risk of depressive symptoms (females >24, males >22) and classification level that indicates the severity of depressive symptoms (minimal, mild, moderate and severe).

Assumptions

- The study of the relationship between extra food intake and depressive symptoms is conceptualised clearly in the study's framework
- The daily food list and mental health questionnaire are suitable instruments to collect the appropriate data for this study.
- A research study investigating the relationship between extra food intake and depressive symptoms has relevance to the mental health profession, and school educators and support services.
- The participants honestly recalled their daily extra food intake and honestly completed the depressive symptom questionnaire.

Delimitations

- This research project was delimited to boys and girls in year 8 to 12. This is because the principal focus is on the extra food intake and mental health of secondary school students who are in the early and middle stages of adolescence.
- Extra food items were delimited to a selected list based on previous research. This research project was only concerned with extra food intake and not the overall diet.
- No links have been made with body mass index or obesity.
- This research project used a screening tool to investigate self-reported depressive symptoms. It is not making a diagnosis of major depressive disorder.
- This study does not measure other risk factors or protective factors.
- One state metropolitan school was used in this study.
- The data was collected over a 7-day period and not on a longitudinal basis.

Limitations

- The current study is a pilot and is not powered to be generalised to the general population.
- This research project relies on self report and participant honesty when completing the research instruments and is therefore subject to individual bias. The daily food recall checklist to collect extra food intake relied on the participant to be motivated to complete it accurately.
- Participants' knowledge that they were collecting data for a study may have changed their usual extra food intake.
- Participants may have been absent some days, therefore may have had to recall more than one day's intake.
- This study researched extra food intake only and did not collect the participant's intake of other food items. The intake of healthier food items may have been consumed and acted as a protective factor to depressive symptoms.
- This research examined participants within the period of adolescence. Adolescence is a period of significant physical and emotional development and is marked by a number of transitional lifestyle changes and stressors. During adolescence, young people are susceptible to social and environmental factors which influence the development of various hazardous behaviours (DiNapoli, 2002). These may include harmful alcohol use,

other drug experimentation, risky sexual activity and suicide ideation (Hair, Park, Thomson, & Moore, 2009). These behaviours may impact on adolescents' mental health status (Walker, Hallfors, Halpern, Iritani, Ford, & Guo, 2006). The study explored only year and gender as demographic factors which may influence the incidence of mental health problems among the participants. Therefore it cannot identify other factors, such as family functioning, parental mental illness, coping style, history of sexual abuse, exposure to other adverse life events or social disadvantage, which may influence mental health (Buzi, Weinman, & Smith, 2007; Parker & Roy, 2001; Rowe et al., 2009; Shahar, Henrich, Winokur, Blatt, Kuperminc, & Leadbeater, 2006). The researcher acknowledges these factors are influential in adolescent mental health status however the research cannot control for all factors.

- The current research did not examine the role of protective factors on depressive symptoms. Protective factors such as resilience, coping style, family cohesion, parental and peer support, and school environment appear to protect young people from depressive symptoms (Liu, 2006; Rowe et al., 2009; Sun & Hui, 2007; Tausig, Michello, & Subedi, 2004; Van Voorhees, Paunesku, Kuwabara, Basu, Gollan, Hankin et al., 2008; Young, Berenson, Cohen, & Garcia, 2005). Not measuring these factors may mean that some participants will present with a high extra food intake and no depressive symptoms. The protective factors in this instance may be playing a protective role against the incidence of depressive symptoms.

- The study of mental health brings a range of known limitations, including low response rate, parental consent and sensitivity of the participants. Mental health research is associated with a number of challenges and ethical considerations (Shochett & O'Gorman, 1995). It is a sensitive area involving screening devices that questions participants about their feelings regarding themselves, their parents, and their peers. Active consent must therefore be obtained from the participants and their parents, and a low response rate may result. The response rate of adolescent participants in previous research has ranged from 40% (Magg & Irvin, 2005) to 79% (Woo, Chang, Fung, Koh, Leong, Kee et al., 2004). Participants or parents may be reluctant to consent to the research because they are aware mental health issues are already apparent. The current research study has implemented appropriate protocols to ensure follow up procedures are in place for participants who indicate at risk responses. Therefore this self selection may bias the results as those already experiencing depressive symptoms may not want their parents to be informed or parents, already aware that their child is already experiencing depressive symptoms, may not want their child to participate.
- School based research is challenging, as it requires active consent and parental consent. Combined with the aforementioned issues related to mental health research, this study recorded a low response rate which may bias the results.

Definition of Terms

Adolescence

The period of transition between childhood and adulthood. Adolescents are defined as people aged 10 – 19 years old (World Health Organisation, 2009). The adolescents involved in this study were aged 12-17 years.

Early Adolescence

Adolescents aged 12-14 years (year 8 and 9).

Mid Adolescence

Adolescents aged 14-15 years (year 10).

Late Adolescence

Adolescents aged 15-17 years (year 11 and 12).

Cut off Score for Depressive Symptoms

A score that delineates students at a greater risk to depressive symptoms (females >24, males >22).

Categories for Depressive Symptoms

Categories that indicate the severity of depressive symptoms. Minimal (0-15), mild (16-20), moderate (21-30) and severe (>31).

Depressive Symptoms

Prolonged feelings of being sad, hopeless, low and inadequate, with a loss of interest or pleasure in activities and often with suicidal thoughts or self-blame (Australian Institute of Health and Welfare., 2010).

Extra Food

Any food or drink item that does not fit within the five main core food groups in the Australian Guide to Healthy Eating (Smith et al., 1998).

Mental Disorders

Conditions characterised by clinically significant sets of symptoms or emotional and behavioural problems associated with personal distress and impaired functioning (American Psychiatric Association, 2000).

Mental Health

A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (World Health Organization, 2008).

Mental Health Problems

The absence of emotional and social wellbeing in which the individual can cope with the normal stresses of life and achieve his or her potential, and an inability to ‘work productively and contribute to community life’ (Muir et al., 2009). Mental health problems include stress, anxiety, depression, or dependence on alcohol or drugs. Individuals with mental health problems may never meet the diagnostic threshold for a mental disorder (Slade et al., 2009).

Resilience

The ability to confront challenges and everyday stressors (Rowe et al., 2009)

Protective Factors

Attributes that assist in protecting adolescents from stressors and their consequences

Rowe et al., 2009)

Risk Factors

Characteristics or behaviours that increase the vulnerability of adolescents to experience depressive symptoms (Rowe et al., 2009)

Young People

People aged between 12 - 24 years (Muir et al., 2009).

Chapter Two: Literature Review

This chapter contains a review of the literature that provided guidance for this study. It begins by introducing adolescence and mental health then outlines the prevalence of mental health and depression in young people, and examines the rise in prevalence rates from late childhood to early adolescence. Risk factors and protective factors for depressive symptoms are then explored, and dietary intake is introduced as a possible risk factor associated with adolescent depression. Next, the current food intake patterns of adolescents are presented and the changes from primary and secondary school are examined. This is followed by a review of the current consumption of extra food and drinks and the influences on extra food intake and timing of intake. Next, the research exploring the association between extra food intake and depressive symptoms in adolescents is explored. The final section comprises a review of the methodological issues related to this research, including considerations for school based research, challenges of mental health research and methods of dietary assessment.

Adolescence and Mental Health

An individual who is mentally healthy is in a complete state of physical, social and mental well being (World Health Organization, 2008). During adolescence, young people may be at an increased risk of mental health problems, including depression, due to the nature of this period of development. Adolescence is the period of transition between childhood and adulthood, and adolescents are defined as people aged 10 – 19 years old (World Health Organisation, 2009). Adolescence is a time of significant physical, social and emotional change, including the onset of puberty, changes in academic and social demands from the transition to high school and changing relationship with family and peers (Muir et al., 2009; Raphael, 2000). During this time, adolescents are also seeking independence and adapting to an increase in autonomy to

make their own decisions (Raphael, 2000). Adolescence is shaped by new experiences and feelings, and young people are trying to figure out where they fit in whilst at the same time, fulfill expectations from their family, friends and society (Rowe et al., 2009).

The Prevalence of Mental Health Problems and Depression in Young People

In 2003, mental disorders accounted for 49% of the overall burden of disease and injury in young people aged 15-24 (Australian Institute of Health and Welfare, 2007). In terms of years of healthy life lost, mental disorders accounted for 61% of non-fatal burden of disease and injury for the same age bracket. In particular, anxiety and depression were the specific causes of this burden for males (17%) and females (32%) (Australian Institute of Health and Welfare, 2007). Data collected in 2007 revealed that one in four young people had experienced a mental disorder by the age of 24 (Slade et al., 2009).

By 2020, WHO predicts depression to be the biggest burden of disease worldwide (World Health Organization, 2009). In Australia, the prevalence of a depressive episode in people age 16-85 years was 4.1% (Slade et al., 2009). One in twenty had experienced a depressive disorder in the previous 12 months. In Australian young people, depression affects one in five before the age of 18 (Rowe et al., 2009). The prevalence rate of young adolescents (age 11-13) in Australia, as indicated by cut off scores that delineate students at greatest risk of depression, is reportedly around 11% (Yap, Allen, & Ladouceur, 2008). The prevalence rate using the same cut off scores in American adolescents in grade 7 to 12 was found to be 10% (Hallfors, Waller, Ford, Halpern, Brodish, & Iritani, 2004). However, research has suggested that the true prevalence of depression is likely to be higher as it may underestimate adolescents who have clinically relevant depressive symptoms but do not meet the criteria for major depressive disorder (Ryan, 2005).

Major Depressive Disorder (MDD) is characterized by one or more major episodes of depression (American Psychiatric Association, 2000). MDD is diagnosed by the presence of at least five of the following symptoms experienced most of the day for at least two consecutive weeks. These include depressed mood most of the day, loss of interest or pleasure, large increase or decrease in appetite, insomnia or excessive sleeping, restlessness or slowness of movement, fatigue or loss of energy, feeling worthlessness or excessive or inappropriate guilt, diminished ability to concentrate or indecisiveness and recurrent thoughts of death or suicide (American Psychiatric Association, 2000).

Year Differences for Depression Symptoms in Young People

Depressive symptoms appear to increase from late childhood to early adolescence, and peak in mid adolescence (Hankin, Mermelstein, & Roesch, 2007; Kort-Butler, 2009; Mazza, Abbott, Flemong, Harachi, Cortes, Park et al., 2009; Van Voorhees et al., 2008). American researchers have found that depressive symptoms tend to increase from year 8 to 10 (age 12 -15) and decline in year 12 (age 15-17) (Audrain-McGovern, Rodriguez, Patel, Faith, Rodgers, & Cuevas, 2006). However, European research has reported that depressive symptoms in year 12 to be higher than symptoms in year 8 (Cuijpers, Boluijt, & van Straten, 2008). Gender specific cut off scores (females >24, males >22) have been created to delineate students at greatest risk of depressive symptoms. Angold (2002) reported that the largest proportion of adolescents who score above the cut off score tends to be greatest at age 14 (year 9 and 10). Canadian research suggests depressive symptoms appear to most severe between 15 and 16 years of age (year 10 and 11) (Poulin, Hand, Boudreau, & Santor, 2005).

The higher incidence and severity of depressive symptoms in mid adolescence may be due to factors specific to this age bracket. In a search for identity, purpose and belonging, mid

adolescence may be a particularly difficult time in trying to fulfill expectations from parents and peers (Rowe et al., 2009). Low perceived peer support, perhaps a result of less optimal peer relationships, fewer friends or reduced popularity becomes more prevalent during year 10 to 12 (Field, Diego, & Sanders, 2001; Newman, Newman, Griffen, O'Connor, & Spas, 2007).

Exposure to negative events, such as bullying or a loss of friends during these years, places adolescents at a high point of stress (Parker & Roy, 2001). Responding negatively to these events and avoiding seeking help subsequently increases the incidence and severity of depressive symptoms during this time (Shahar et al., 2006).

Gender Differences for Depression Symptoms in Young People

Female adolescents consistently report a greater prevalence of depressive symptoms than males (Hankin et al., 2007; Kort-Butler, 2009; Mazza et al., 2009; Van Voorhees et al., 2008).

Australian and international researchers have found that adolescent girls show significantly higher levels of depressive symptoms than boys (Allison, Roeger, Martin, & Keeves, 2001; Cuijpers et al., 2008; Leher, Shrier, Gortmaker, & Buka, 2006). The prevalence rate in girls has been reported to be as much as three times the prevalence rate in boys (Poulin et al., 2005).

The application of gender specific cut off scores (females >24, males >22) to American research found that significantly more adolescent girls than boys were categorised above this cut off score (Lehrer, Shrier, Gortmaker, & Buka, 2006). Australian research reported 22% of girls and 16% of boys scored above the gender specific cut off scores (Sawyer, Pfeiffer, & Spence, 2009). Similarly, Munafo, Hitsman, Rende, Metcalfe and Niaura (2007) found 17.5% of males and 18% of females were categorised above the cut off scores.

Australian research that shows the severity of depressive symptoms is also reportedly greater in girls than boys (Allison et al., 2001). The trajectory for adolescent girls appears to be characterized by a sharp increase in symptoms from late childhood, which eventually peaks in mid adolescence (Dekker, Ferdinand, Van Lang, Bongers, Van Der Ende, & Verhulst, 2007). Research has reported that depressive symptoms in girls appear to increase from year 7 to 9 (age 11-13), peak in year 10 (age 14-15) and decline in year 12 (age 16-17). In contrast, the high incidence of depressive symptoms in late childhood for boys declines by mid adolescence (Dekker et al., 2007).

These gender differences may be due to the earlier onset of puberty, differences in the way girls experience feelings and emotions to boys, or the greater odds in being exposed to domestic violence and sexual abuse (Rowe et al., 2009). Stemmler and Peterson (2005) propose that girls often experience a more difficult adolescent transition than boys, and coupled with a greater vulnerability to have an anxious temperament and insecure parental attachment, are at greater risk of depressive symptoms. Alternatively, other researchers (Meadows, Brown, & Elder, 2006) argue that females have a higher prevalence of depressive symptoms than boys because of the different ways in which they react to negative life events and daily stressors. Hankin (2009) suggests that the onset of depressive symptoms in girls results from experience with more stressors and reacting to these stressors in a negative light.

Despite the significant change occurring during this time, the rise in prevalence of depression does not usually result from adolescence. The reason why some adolescents have depression and others do not can partly be explained by a complex and dynamic interaction of protective and risk factors influenced by their social, economic and cultural environments (Raphael, 2000). Biological or genetic vulnerabilities, coupled with environmental influences

places adolescents, already in a period of risk, at a point of high anxiety and stress. Protective factors including parental and peer support, positive thinking and instrumental coping strategies are crucial at this point to overcome this stress and adapt to transitional changes, and in turn reduce the likelihood of experiencing depressive symptoms (Raphael, 2000).

Protective factors on depressive symptoms

Protective factors are defined as attributes that assist in protecting adolescents from stressors and their consequences (Rowe et al., 2009). One of the biggest protectors against depressive symptoms is resilience, the ability to confront challenges and everyday stressors, which stems from the adolescent's inner strengths and external supports (Rowe et al., 2009). Resilient young people tend to rebound positively from adversity and become even stronger to face future challenges. Resilience relies on protective factors to assist adolescents to overcome stress, build confidence and better equip them to solve problems (Rowe et al., 2009). Coping style, family cohesion, and parental and peer support have been identified as important protective factors in building resilience and protecting adolescents from experiencing depressive symptoms.

Positive coping style

Individuals with an active coping style, good problem solving skills and a favorable self concept appear less likely to experience a depressive episode (Van Voorhees et al., 2008). A positive coping style incorporates optimistic thinking and a more positive frame of mind. Optimistic adolescents tend to be less angry and have higher self esteem and a greater level of control (Puskar, Sereika, Lamb, Tusaie-Mumford, & McGuinness, 1999). Consequently, they tend to have less depressive symptoms. Constructive thinking and problem-solving coping strategies allows adolescents to approach life's challenges better and deal with difficult situations more effectively (Rowe et al., 2009). Better decision making skills, a belief in one's own

abilities, hopefulness and self confidence is important for adolescent emotional and social well being (Kinnunen, Laukkanen, Kiviniemi, & Kylmä, 2010). The development of these attributes is also crucial to better coping strategies later in life.

Spirituality

Spirituality appears to be an important protective factor for health risk behaviours in adolescents. Higher levels of spiritual support, defined by taking meaning from spiritual or religious beliefs, appears to be associated with fewer depressive symptoms (Wright, Frost, & Wisecarver, 1993). Risk of suicide and recent suicide attempts also appears to be lowered with commitment to religious beliefs and religious influence (Greening & Stoppelbein, 2002; Rew, Thomas, Horner, Resnick, & Beuhring, 2001). Research has found that when adolescents have positive interpersonal religious experiences and identify themselves with a religious or spiritual person or community, their level of depressive symptomology is lowered (Pearce, Little, & Perez, 2003). In contrast, when their experiences are negative, the odds of depressive symptoms increase. It appears that support and connectedness provided by spirituality plays an important protective role in mental health risk behaviours (Cotton, Zebracki, Rosenthal, Tsevat, & Drotar, 2006).

Family cohesion

Family cohesion tends to result in reduced depressive symptoms (Sun & Hui, 2007). Adolescents that feel their family relates well to one another and perceive a greater level of family support are often less likely to develop a depressive episode (Van Voorhees et al., 2008). Family cohesion appears to have a moderating effect between depression and suicide ideation. At risk of depression, children and adolescents that have a positive self concept and strong family cohesion tend to have a reduced risk of suicidal thoughts and/or suicide attempts (Au, Lau, &

Lee, 2009). Family dynamics are important, and teenagers feel loved and respected when they are given space, support, understanding and offered advice only when asked. Strong family cohesion fosters autonomy, builds confidence and protects adolescents from feeling alone, upset or depressed (Rowe et al., 2009).

Parental and Peer support

Feeling accepted by peers tends to be associated with a significant reduction in the probability of experiencing a depressive episode (Van Voorhees et al., 2008). Support networks provide instrumental and emotional support, and play a crucial role in overcoming everyday stressors and reducing the level of distress (Tausig et al., 2004). People with strong support networks tend to have a greater sense of control and identity, and have positive well being. In adolescents, a secure attachment to parents is often related to a greater perception of supportive relationship with peers, less negative interactions with peers and fewer depressive symptoms (Liu, 2006). The combination between perceived parental support and peer support appears important in reducing the symptoms of depression in adolescents (Young et al., 2005).

School environment

The school environment plays an important role in adolescent social and emotional development (Rowe et al., 2009). A supportive school allows its students to feel positive and safe, and teachers play a crucial role in making students feel supported and acknowledged. Teachers foster the development of self confidence and resilience that assist to protect young people from depression (Rowe et al., 2009). School support services and counselors also play an important role in the management of adolescent depression. A minority of young people aged 13-17 years access professional services for mental health problems, including depression, however school counseling is often reported as the most common place that young people seek

help (Sawyer et al., 2007; Slade et al., 2009). Interventions to address the risk factors for adolescent depression are suitable in school environments, and continuing to ensure that school support services are approachable will assist in further protecting adolescents from experiencing depressive symptoms.

Food

Previous research related to food intake and mental health indicates that the quality of dietary intake, family meals and breakfast habits may provide protection against mental health issues (Brooks, Harris, Thrall, & Woods, 2002; Eisenberg, Neumark-Sztainer, Fulkerson, & Story, 2008; Fulkerson et al., 2006; Jacka, Pasco et al., 2010; Jarvelaid, 2008; O'Sullivan et al., 2008; Oddy et al., 2009).

Diet quality

Fruit and vegetables are nutrient rich and are important for good health. Previous research has suggested that a healthy diet, rich in essential vitamins and minerals in adolescence, appears to play an important protective role against stress and depression (Brooks et al., 2002). Jacka et al., (2010) found that when a traditional diet (vegetables, fruit, beef, lamb, fish and whole grain foods) replaces a western-style diet (high in processed foods), the odds of depression are significantly reduced. It appears that the nutrients found in healthy food play an important role in releasing an effective balance of neurotransmitters, such as dopamine, serotonin and norepinephrine which control an individual's mood and behaviour (Dunne, 2010).

Omega 3 fatty acids are particularly important nutrients related to behaviour, learning and mood (Richardson, 2003). A growing body of research has found that lower levels of omega 3 fatty acids appear to increase the risk of depressive symptoms (Dunne, 2010; Jacka et al., 2004;

Richardson, 2003; Tomlinson, Wilkinson, & Wilkinson, 2009). Therefore, the consumption of foods rich in omega 3 fatty acids, such as fish, appears beneficial as a protective role against depression (Bamber et al., 2007). Vitamin B nutrients such as folate or folic acid found in healthy food also appears to influence positive mental health because of its important role in the production of serotonin and other neurotransmitters (Dunne, 2010). A deficiency in Vitamin B has been linked with sleeplessness, fatigue, memory loss, and an increased risk of depressive symptoms (Coppen & Bailey, 2000; Hakkarainen, Partonen, Haukka, Virtamo, Albanes, & Lönnqvist, 2004; Tomlinson et al., 2009)

However despite these documented links, other research has found that adolescents with depressive symptoms eat a greater amount of fruit and vegetables (Lytle et al., 2003). This conflicting finding may be part due to a greater intake of food in general and not a greater consumption of fruit and vegetables. Despite this, Baines, Powers and Brown (2006) has noted that the mental health of vegetarians appears better than non vegetarians or semi vegetarians in young women (Baines et al., 2006).

Family meals

Regular family meals enhance adolescent health and well being (Eisenberg et al., 2008). Eating regular meals with family members appears to reduce the odds of self-reported depressive symptoms in adolescents (Fulkerson et al., 2004). More specifically, eating five or more meals with the family at dinner time during a week period, can reduce the odds of adolescents reporting depression by as much as half (Fulkerson et al., 2006). Frequent family meals tend to reduce the likelihood of tobacco, alcohol and marijuana use, poor school performance, depressive symptoms and suicidality (Eisenberg et al., 2008). Regular family meals appear to be an

important marker of healthy dietary intake, and are associated with a higher consumption of fruit, vegetables and dairy foods (Videon & Manning, 2003).

The positive influences of regular family meals is commonly linked to the connectedness that family meals promote through the opportunity for parents and children to come together and talk (Neumark-Sztainer et al., 2000). Family meals offer routine and consistency, and offer the chance for parents and adolescents to connect and communicate, which is related to healthy adolescent development (Eisenberg, Olson, Neumark-Sztainer, Story, & Bearinger, 2004).

Breakfast habits

Breakfast consumption is very beneficial to adolescent health, because of the associated effects with positive nutrient intake, better physical health and improved feelings of well being (Jarvelaid, 2008; Keski-Rahkonen, Kaprio, Rissanen, Virkkunen, & Rose, 2003; O'Sullivan et al., 2008; Radcliffe, Ogden, Coyne, & Craig, 2004). Larson et al., (2008) identified that the likelihood of a greater intake of fruit and vegetables in young adulthood, results from the consumption of breakfast during mid adolescence, indicating the long term benefit of good breakfast habits (Larson et al., 2008). Breakfast appears to be a marker of healthy eating habits and is important for adolescent health and development. O'Sullivan et al. (2008) found that adolescents who eat a high quality breakfast tend to have better mental health, particularly less externalizing mental health behaviours, such as delinquency and aggression. Therefore, although limited, this research suggests that breakfast may have the potential to play a protective role on adolescent depressive symptoms.

Risk factors on Depressive Symptoms

Risk factors are characteristics or behaviours that increase the vulnerability of adolescents to experience depressive symptoms (Rowe et al., 2009). Depressed parents, low socio economic status, low perceived parental and peer support, negative life events, negative thinking and hazardous behaviours have been identified as risk factors to depressive symptoms in adolescents.

Depressed parents

Adolescents with depressive symptoms are more likely to have depressed parents (Field et al., 2001). Specifically, adolescents with a depressed parent are two times more likely to present with symptoms of clinical depression than those adolescents without a depressed parent (Ohannessian, Hesselbrock, Kramer, Kuperman, Bucholz, Schuckit et al., 2005). In particular, girls are at greatest risk of depressive symptoms from maternal depression than boys (Chen, Johnston, Sheeber, & Leve, 2009). Longitudinal research conducted over 20 years found that the mean age of onset of major depression was lower and the rate of increase between 15 and 20 years was sharper in offspring of depressed parents during adolescence (Weissman, Wickramaratne, Nomura, Warner, Pilowsky, & Verdeli, 2006). The rates of anxiety disorders and substance dependence also attained during adolescence in offspring of depressed parents remained with them until adulthood. It is clear that adolescents of depressed parents represent a high risk group.

Low socio economic status

There has been a consistent relationship between lower socio-economic status and higher rates of mental health problems. Adolescents with mental health problems are more likely to be from single parent families, parents with low income, parents not in paid employment and

parents who left school at an early age (Sawyer et al., 2007). Families with low socio-economic status are frequently exposed to stressful circumstances, including poor living conditions, unemployment, low income and limited education, and because they often have minimal financial and emotional support, they tend to lose their sense of control, feel demoralized, lose their sense of identity and consequently become distressed (Tausig et al., 2004). The prevalence rates of self reported depression, alongside alcohol and drug problems, and suicide attempts tend to rise with a decrease in socio economic status (Taylor, Page, Morrell, Harrison, & Carter, 2005).

Low perceived parental and peer support

A lower perceived level of parental support strongly predicts depressive symptoms in adolescents (Young et al., 2005). Symptoms of MDD are more common in those people with no family members or friends they can rely on or confide in (Slade et al., 2009). Adolescents with depressive symptoms tend to have less optimal peer relationships, fewer friends and reduced popularity than adolescents without depressive symptoms (Field et al., 2001). Lower parental support and peer support in early adolescence tends to be associated with lower depressive symptoms in middle adolescence (Newman et al., 2007). In particular, a negative change in parental and peer support in the transition to high school predicts depressive symptoms in young adolescents.

Negative life events

Negative life events can influence initial levels of depressive symptoms (Kercher, Rapee, & Schniering, 2009). A significant positive relationship has been found between greater exposure to negative life events and greater depressive symptoms (Sawyer et al., 2009). A breakup of a romantic relationship, a loss of friends, divorce of their parents or the death of a

family member or close friend can be particularly difficult for adolescents (Parker & Roy, 2001). Stressful life events tend to be associated with depressive problems in both genders, but significantly stronger in girls than boys (Bouma, Ormel, Verhulst, & Oldehinkel, 2008). Girls tend to be more sensitive to negative events than boys, or confront different experiences, such as sexual abuse, which is amongst the most potent factors predicting depression in female adolescents (Buzi et al., 2007).

Bullying

Daily events such as bullying are also extremely harmful to the emotional well being of adolescents, and victims of bullying tend to experience loneliness, poor academic achievement, difficulty with peer relationships, anxiety and depression (Rowe et al., 2009). Bullying encompasses not only physical harm, but also verbal insults, deliberately ignoring someone, or isolating or excluding people from the group (Rowe et al., 2009). Cyber bullying can be particularly concerning as it allows bullies to send hurtful messages or post photos on social networking sites, email, chat rooms or via mobile about others. Bullies tend to target people who are 'different' and when there is a perceived or real imbalance of power between the bully and the victim (Rowe et al., 2009). Racial and homophobic insults are common, and adolescents from racial, same sex attracted, religious or ethnic minority groups may feel left out, isolated and helpless, and are at an increased risk of depression.

Negative thinking

Negative thinking and coping style influence the association between negative life events and depressive symptoms (Stemmler & Petersen, 2005). Negative thinking encompasses an adolescent's interpretation towards a negative event and is a strong predictor of depressive symptoms (Charoensuk, 2007; Kercher et al., 2009). Thoughts of hopelessness, failure or loss

and/or doubt erode an adolescent's level of resilience and influence an increase in depressive symptoms (Rowe et al., 2009). Responding to negative life events with a negative coping style and less optimistic thinking increases the risk of depressive symptoms (Sawyer et al., 2009). Adolescents who view negative life events through avoidance and unconstructive thinking are less likely to seek support and use problem solving, and perceive a lack of control over stressful circumstances (Shahar et al., 2006). Less use of problem focused and distractive coping places adolescents, particularly females, at a greater risk of depressive symptoms (Li, DiGiuseppe, & Froh, 2006).

Hazardous Behaviours

Alcohol

In the Australian School Students Alcohol and Drug Survey 2008 (ASSAD), over 60% of Western Australian high school students aged 12 -17 years reported alcohol consumption in the past year, 40.2% in the past month and 26.9% of students consumed alcohol in the past week (Griffiths, Kalic, & Gunnell, 2009). Just over a quarter (26.5%) of males aged 14-17 years consumed seven or more standard drinks on any one day in the last week. More females (32.5%) in the same age bracket consumed five or more standard drinks on any one day in the last week. A significant shift in the proportion of 'at risk' drinkers existed between 16 and 17 years in both males and females. At each age between 14 and 17 years, more females than males drank at levels to increase the risk of short term harm.

More drinking occasions appears to be associated with an increase in depressive symptoms (Owens, Shippee, & Hensel, 2008). Females who drink alcohol are at a two-fold risk of elevated depressive symptoms than males (Poulin et al., 2005). High school students with

depressive symptoms are likely to have a steeper linear increase in the number of drinking occasions over time (Owens et al., 2008). A faster increase in depressive symptoms over time is also associated with a larger increase in drinking occasions in each successive year of high school.

Cigarette smoking

Since 1984, the prevalence of Western Australian high school students aged 12 -17 years who have never smoked, has declined (Griffiths et al., 2009). However, in 2008, 15.9% of students had smoked in the past year, 7.7% in the past month and 4.8% in the past week. Since 2005, the prevalence rate of high school students who have smoked has reduced from 17.6% in the past year, 8.7% in the past month and 6.1% in the past week. In 2008, more females (7.5%) than males (6.2%) aged 14-17 years smoked in the past week. Of those who did smoke in the last week, figures demonstrating the mean number of cigarettes smoked per week indicated that males smoke a greater number of cigarettes (22) than females (15.5) aged 14-17 years.

Regular smoking can be detrimental to mental health and can predict changes in depressed mood (Munafo et al., 2007). Adolescents who smoke cigarettes had significantly increased odds of having symptoms of depression for both males and females aged 14-18 years (Chang, Sherritt, & Knight, 2005). In addition, smoking progression from mid to late adolescence is predicted by high depressive symptoms in mid adolescence (Audrain-McGovern et al., 2006)

Cannabis use

ASSAD 2008 indicated that majority (80.5%) of high school students aged 12-17 years had never consumed an illicit drug in their lifetime (Griffiths et al., 2009). Of those who had, cannabis was the most commonly reported illicit drug, with 7.8% of people using the drug in the

past month, followed by amphetamines. More males than females had used cannabis in the past month. There has been a significant decrease in the percentage of Western Australian students who have used cannabis between 2002 and 2008 in both male and females aged 12-17 years.

Weekly or daily cannabis use appears to be a significant predictor of very high depressive symptoms levels (Poulin et al., 2005). Australian researchers found that male adolescents with higher depressive symptoms were more likely to have used cannabis than those with less depressive symptoms (Rey, Sawyer, Raphael, Patton, & Lynskey, 2002). Sawyer et al. (2007) reported that adolescents with depressive symptoms are two times more likely to use marijuana. Similarly, females with a high depressive symptom level were more likely to have used cannabis by five times than females with less depressive symptoms (Rey et al., 2002).

Unsafe sex

The 4th National Survey of Australian Secondary Students, HIV/AIDS and Sexual Health, indicated that 78% of students in years 10 and 12 had experienced some form of sexual activity (Smith, Agius, Mitchell, Barrett, & Pitts, 2009). Forty four percent of students reported giving or receiving oral sex. Twenty five percent of year 10 students and fifty percent of year 12 students reported sexual intercourse. Thirty percent of students reported having three or more sexual partners and 38% stated they had unwanted sexual intercourse. Being too drunk (17%) and pressure from partners (17.6%) were common reasons for unwanted sex.

One third of students in the 4th National Survey of Australian Secondary Students, HIV/AIDS and Sexual Health reported they felt positive after their sex experience. Others felt extremely used (9%), regretful (7%), worried (7%), upset (4%) or guilty (3%). Since 2002, the satisfaction of students to their last sexual encounter has declined, with less students feeling

extremely loved, fantastic, good or happy (Smith et al., 2009). Adolescents that feel negatively towards their last sexual experience often feel emotionally unstable and may be more vulnerable to an increase in depressive symptoms with each advancing stage of sexual experience (Riittakerttu, Kosunen, & Rimpela, 2003).

Generally, adolescents who are sexually active often report greater depressive symptoms compared with adolescents who are not sexually active (Monahan & Lee, 2008). In light of this finding, the perceptions towards first sexual intercourse should be considered. Negative sexual experiences often result from peer pressure, the influence of alcohol or simply wanting to 'grow up' (Skinner, Smith, Fenwick, Fyfe, & Hendriks, 2008). These adolescents perceive less control over the timing of their first sexual intercourse and often recount regretful or disappointing experiences.

High depressive symptom levels have been found to be significantly associated with greater odds of sexual risk behaviours, including not using a condom, not using birth control and alcohol and/or other drug use at last sexual activity in male high school students (Lehrer et al., 2006). For girls, as depressive symptoms increased, significant associations were found with condom non use, birth control non use and more than or equal to three sexual partners in the past year.

Suicidality

Suicidality (suicide thoughts, planned suicide and attempted suicide) is common in young people. In 2007, 20% of males aged 15-25 and 15% of females aged 15-24 committed suicide in Australia (Australian Bureau of Statistics, 2009). Whilst it is ranked 15th in the causes of death for the broad population, it sits as the leader in Australian young people (Muir et al., 2009). The

2007 National Survey of Mental Health and Wellbeing indicated that 8% of males aged 16-24 and 14% of females had suicidal thoughts (Slade et al., 2009). Two percent of males and 6% of females had planned suicide, but 1% and 6% of males and females aged 16-24 attempted suicide respectively. Whilst adolescent girls have more attempts at suicide, boys tend to succeed more often because of the differences in the lethality of methods used (hanging or shooting themselves) (Rowe et al., 2009).

Depressive symptoms are a major contributor to suicidal ideation and suicide attempt (Hallfors et al., 2004; Liu, 2006; Stanard, 2000). Depressive symptoms have been found to be positively associated with suicidal thinking in secondary school students (Liu, 2006; Waldrop, Hanson, Resnick, Kilpatrick, Naugle, & Saunders, 2007). Australian research indicated that the probability of reporting suicidal ideation increases significantly with a higher depressive symptomology, particularly in girls in year eight (Allison et al., 2001). Adolescents with symptoms of major depressive disorder are four times more likely to report suicidal ideation and six times more likely to report suicide attempts (Waldrop et al., 2007).

Adolescent eating behaviours

Adolescence is marked by a change in food intake patterns, including food restriction, the consumption of less fruit and vegetables, irregular family meals and breakfast skipping (Martin, Rosenberg, Miller, French, McCormack, Bull et al., 2009). Adolescents also tend to snack frequently and consume a large amount of extra food (Savidge et al., 2007).

Food restriction

Food restriction behaviours in adolescents appear to be linked to depression. Fulkerson et al. (2004) identified an association between unhealthy weight-control and dieting, with an

increase in depressive symptoms for male and female adolescents. Similarly, other research reported a high prevalence of adolescent depression amongst dieters in a clinical sample (Abrantes, Strong, Ramsey, Lewinsohn, & Brown, 2006). In a high school sample of 4700 students, a study found that adolescents who engaged in weight reducing methods had higher self-reported depression scores (Tomori & Rus-Makovec, 2000). This group was more likely to be dissatisfied with their body weight and had lower self esteem.

Fruit and vegetable intake

A lower quality diet with reduced fruit and vegetable intake appears to be linked with greater odds of depressive symptoms (Jacka, Kremer et al., 2010; Jacka, Pasco et al., 2010; Oddy et al., 2009). An inadequate consumption of nutrients found in fruit and vegetables contribute to lowering neurotransmitters in the brain and altering mood to increase stress and tension, and reduce joy and alertness (Dunne, 2010). National research found that with increasing age, older secondary school students (19.5%) are less likely to meet the recommended vegetable intake than younger secondary school students (21.6%) (Scully, Dixon, White, & Beckmann, 2007).

National research indicates that only 13.1% of Australian secondary students appear to be meeting the recommended fruit and vegetable guidelines (Scully et al., 2007). Older students and females were even less likely to meet the recommended intake. Queensland (QLD) figures revealed that only 23.5% of secondary boys and 22.3% of secondary girls met the recommended daily intake of four serves of vegetables (Abbott, Macdonald, Stubbs, Lee, Harper, & Davies, 2007). Similarly, New South Wales (NSW) reported only 22.3% of boys and 22.3% of girls in year eight, and 17.7% of boys and 17.6% of girls in year 10 met the recommended vegetable intake. The 2008 Western Australian Child and Adolescent Physical Activity and Nutrition

Survey (CAPANS) found only 28.1% of boys and 23.6% of girls in secondary school consumed the recommended vegetable intake (Martin et al., 2009).

Queensland research revealed that one in six girls and boys in year ten met the recommended intake of three serves of fruit per day. NSW figures revealed that just over 30% of boys and 34.1% of girls in year eight and, 34.9% of boys and 33% of girls in year ten ate less than two serves of fruit per day (Booth, Okley, Denney-Wilson, Hardy, Yang, & Dobbins, 2004). In Western Australia, 22.2% of boys and 28.3% of girls met the recommended guidelines for fruit intake (Martin et al., 2009).

Family meals

Less frequent family meals tend to be associated with hazardous behaviours in adolescents, including an increased odds of depressive symptoms and suicidality (Eisenberg et al., 2004; Fulkerson et al., 2004; Fulkerson et al., 2006). Adolescents with fewer family meals per week tend to engage in more health compromising behaviours, such as skipping breakfast and have a poorer consumption of fruit, vegetables and dairy products (Videon & Manning, 2003). Adolescents with less regular family meals during the week are more likely to smoke, drink alcohol and use cannabis (Eisenberg et al., 2008). Fewer family meals have also been linked to antisocial behaviour or violence, school problems, and unhealthy eating behaviours, such as binge eating (Fulkerson et al., 2006). Irregular family meals means there is less opportunity for parents and adolescents to connect and communicate, which threatens the cohesion of the family unit and its contribution to an adolescent's emotional well being (Rowe et al., 2009).

QLD research observed a decline in regular family meals between primary and secondary school (Abbott et al., 2007). In primary school, 84.6% of boys and 83.5% of girls ate regular meals, whilst in secondary school, figures were lower for boys (70.2%) and girls (67%). More than 50% of all children watched television whilst eating a family meal at least once a week. The proportion of children watching television during their family meal increased from one in six in primary school to three in ten in year ten (Abbott et al., 2007)

Similarly, in Western Australia, the majority of children did eat regular family meals at least five times per week, however the proportion declined from primary to secondary school (Martin et al., 2009). More primary school boys (82.5%) than secondary school boys (66.3%) ate regular meals, and a greater proportion of girls in primary school (84.2%) ate regular meals than those in secondary school (68.4%). No significant differences were evident between 2003 and 2008 (Martin et al., 2009).

Breakfast habits

Cross sectional research has found that skipping breakfast and eating a lower quality breakfast appears associated with depressive symptoms in adolescents (Jarvelaid, 2008; O'Sullivan et al., 2008). Adolescents who eat breakfast 'once a week or less often' are also more likely to smoke, drink alcohol more frequently and drink coffee and soft drink more often (Keski-Rahkonen et al., 2003). Adolescents who do not eat breakfast tend to have less healthy diets (Sjoberg, Hallberg, & Hulthen, 2003; Storey, Hanning, Lambraki, Driezen, Fraser, & McCargar, 2009).

Twenty two percent (22%) of QLD children in grade five, seven and eight, ate at least one 'energy-dense, micronutrient poor' (EDMP) food item for breakfast (Radcliffe et al., 2004).

Whilst the quality of breakfast is not associated with parental preparation, it remains unclear whether the intake of EDMP food is related to it being provided at home, in children's lunch boxes or purchased on the way to school. This suggests that the provision of breakfast at school is an important initiative in improving the quality of breakfast and reducing the purchase of EDMP food items.

A higher proportion of primary school children ate breakfast everyday in QLD (Abbott et al., 2007). Over 91% of primary school boys and 86.6% of primary school girls ate breakfast daily. In secondary school, six in ten year 10 students ate breakfast everyday (Abbott et al., 2006). Girls (53.8%) were least likely to eat breakfast everyday than boys (72.8%). Only 4.8% of secondary school boys never ate breakfast, but concerningly, 11.3% of secondary school girls rarely or never ate breakfast (Abbott et al., 2007). In NSW figures revealed that most year eight boys (73.8%) and girls (66.3%) consumed breakfast daily, as did boys (67.2%) and girls (58.5%) in year 10 (Booth et al., 2004). Fourteen percent of year 10 girls ate breakfast less than once a week. In WA, 28.5% of boys and 38.5% of girls indicated they did not eat breakfast every day (Martin et al., 2009).

Extra food intake in adolescents

Australian research has found that during adolescence, the consumption of take away, snacks, confectionary, soft drinks and energy drinks increases (Abbott et al., 2007; Booth et al., 2004; Martin et al., 2009; Scully et al., 2007). These extra foods are generally nutritionally poor and energy dense, and contain high amounts of fat, salt and/or sugar (Smith et al., 1998). Extra food intake is reportedly detrimental to adolescent mental health. The intake of unhealthy and processed foods has been found to increase the odds of depression (Akbaraly et al., 2009; Oddy et al., 2009).

Take away foods

QLD research found that one third of all children consumed fast food once a week (Abbott et al., 2007). Also reported was that whilst three in five primary school aged children ate fast food once a fortnight, more secondary students consume fast food at least 2-4 times per week. Twenty five percent of year ten students in QLD had eaten fast food on the day of their survey. NSW research showed that the consumption of hot chips and fried potato products tended to increase with age from year six to year 10 (Booth et al., 2004). Similarly, Scully et al (2007) found that in secondary school, the proportion of students eating fast food at least twice a week increased from 39.5% among 12-13 year-olds to 50.5% among 16-17 year-olds.

In QLD, more boys had consumed take away food on the day of being surveyed than girls in both primary and secondary school (Abbott et al., 2007). When reported frequency is assessed, it appears that a greater percentage of boys in both primary and secondary school eat fast food at a higher frequency than girls of the same age. Other research has observed that slightly more females in NSW consume hot chips and friend potato products everyday in year 6, but less than boys in year eight and ten (Booth et al., 2004). In secondary school, Scully et al (2007) found that boys are more likely to consume fast food more often than girls. More boys appear to consume fast food at least twice a week than girls aged 12-13 years (41.4% compared to 37.5%), 14-15 years (49.7% compared to 46%) and 16-17 years (54.4% compared to 46.8%). WA research revealed that the proportion of students consuming food from fast food chains at least once a week remained consistent in primary and secondary school (Martin et al., 2009). One third consumed fast food at least once a week. Consumption was significantly greater in boys (33.7%) than girls (18.4%).

Party food

Abbott et al. (2007) found that in QLD, the mean daily intake of confectionary increased in children from primary to secondary school. This trend was also observed in national research of children and adolescents between the age of 9-13 years and 14-16 years (Commonwealth Scientific Industrial Research Organisation, 2008). Similarly, Booth et al., (2004) reported that 20% of NSW year six students ate confectionary on a regular basis. Consumption increased in secondary school, whereby the proportion of students' regularly consuming confectionary was 25-30%.

QLD research revealed that the consumption of confectionary in the previous 12 months was higher for both primary and secondary school girls, but the difference was greater in year ten between boys (41%) and girls (50%) (Abbott et al., 2007). In NSW, a greater percentage of girls in year six, eight and ten consume confectionary at least 1-3 times per week, and the proportion of students consuming confectionary everyday increases for both boys and girls (Booth et al., 2004). Despite this, it appears that the percentage of boys consuming confectionary at this frequency reduces from 14% in year eight to 8.5% in year ten for boys, and increases from 10.7% to 13.6% for girls. WA research revealed that 44% of secondary school students had consumed confectionary, including 46% of girls and 41.4% of boys (Martin et al., 2009).

Snack foods

QLD research revealed that proportion of students consuming snack foods decreased from primary school (year five) to secondary school (year 10) (Abbott et al., 2007). However, national research indicated that the mean daily consumption of snack foods increased from age 9-13 years to 14-16 years in boys and girls (Commonwealth Scientific Industrial Research Organisation, 2008). The proportion of students in secondary school who consume snack food at

least four times per week appears to increase from 45.5% at 12-13 years to 55.3% at 16-17 years (Scully et al., 2007).

In NSW, Booth et al. (2004) found that the proportion of boys consuming snacks 1-3 times per week increased from year six (29.1%) to year eight (39.9%), but declined in year ten (33.3%). Generally more boys than girls ate snacks in primary and secondary school, but large differences were noted in year ten between boys (25.2%) and girls (17.7%) consuming at least four snacks per week (Booth et al., 2004). Snack food consumption is higher amongst girls aged 12-13 years and 14-15 years, but lower than boys aged 16-17 years (Scully et al., 2007). In WA, the percentage of secondary students consuming snack foods appears to decrease from primary to secondary school (Martin et al., 2009). In secondary school, 25% of secondary school students had consumed snack foods, and consumption appeared to be greater in boys (30%) than girls (21%).

Drinks

QLD research indicated that soft drink consumption increased with age. Three in ten primary school children consumed soft drink once a week, whilst seven in ten boys and five in ten girls in secondary school consumed soft drink at the same frequency (Abbott et al., 2007). One in four year ten girls and two in five year ten boys consumed soft drink two to four times per week. Booth et al., (2004) also found an increase in soft drink with age, but noted significant differences between boys and girls at each year level.

In secondary school, more boys consume energy drinks and soft drinks than girls. In QLD, more boys drink soft drink once a week, two to four times per week and consume energy drinks once a week than girls in a year 10 (Abbott et al., 2007). Similarly, significantly more

NSW boys (55%) than girls (35.7%) were reported to drink more than two servings of soft drink per day (Booth et al., 2004). National research indicated that 48.7% of males and 39% of females consuming high energy drinks more than four times in the previous week of being surveyed (Scully et al., 2007).

A significant gender difference has been observed in the consumption of energy drinks between the age of 12-13 years and 14-15 years (Scully et al., 2007). Forty percent of males and 34% of females aged 12-13 years consume more than four high energy drinks in the previous week. By aged 14-15 years, 51% of males and 42% of females were consuming high energy drinks at the same frequency. The proportion of males drinking energy drinks increased to 56% by age 16-17 years, but the percentage declined with females to 40.8% (Scully et al., 2007).

It also appeared that the consumption of energy drinks increased with age. In primary school, over 90% had never consumed an energy drink, however in secondary school, one in six boys and one in eight girls reported drinking energy drinks at least once a week (Abbott et al., 2007). In national research, 44% of Australian secondary students reported they had consumed high energy drinks at least four times in the previous week (Scully et al., 2007). Consumption at this frequency increased with age from 37.9% in those aged 12-13 years to 48.3% at 16-17 years.

Influences on Adolescent Eating Behaviours

Adolescent eating behaviours appear to be influenced by a number of factors. These include socio economic status, taste, food availability and accessibility, parents, peers, television viewing and advertising.

Socioeconomic status

Socioeconomic status appears to influence the quality of food adolescents consume. In a study of high school students, adolescent girls with a lower socioeconomic status (SES) were more likely to eat fast food frequently than girls of a higher socioeconomic status (Bauer, Larson, Nelson, Story, & Neumark-Sztainer, 2008). In contrast, higher SES is associated with consuming more fruit and vegetables, and less high fat foods (Boutelle, Birnbaum, Lytle, Murray, & Story, 2003). Other socio demographic factors, such as parents' education level and family income appear to influence the diet quality of children and adolescents (Patrick & Nicklas, 2005).

Taste

Taste appears an important determinant of food selection. A taste preference for unhealthy food predicts fast food consumption (Bauer et al., 2008; O'Dea, 2003). Similarly, enjoying the taste of soft drink predicted regular soft drink consumption in male adolescents (Kassem & Lee, 2004). In a qualitative review of the factors influencing adolescents' food choice, taste was the most frequently reported barrier to eating healthy food (Giskes, Patterson, Turrell, & Newman, 2005). Most perceived it to be less tasty than unhealthy food. Other research has identified that those adolescents with an intention to eat a healthy diet, tend to enjoy the taste of healthful foods (Backman, Haddad, Lee, Johnston, & Hodgkin, 2002).

Food availability and accessibility

Adolescents with poor diet quality tend to consume more 'other (extra) foods' and eat significantly more meals or snacks away from home (Storey et al., 2009). Healthy food is perceived to be less available, expensive and requires more time and energy to prepare, whereas fast food is more convenient (Croll, Neumark-Sztainer, & Story, 2001; Giskes et al., 2005;

O'Dea, 2003). Adolescents who consume more high-fat snacks perceive these snacks to be highly accessible and available to them (Martens, Van Assema, & Brug, 2005). The food available away from home does tend to be more energy dense and nutritionally poor (Nielsen, Siega-Riz, & Popkin, 2002). In most instances, healthy food available away from home is less appealing and unhealthy options are perceived to taste better (Croll et al., 2001).

In a study of Canadian adolescents, a poor diet quality was significantly associated with consuming more meals or snacks away from home than those with a superior quality diet (Storey et al., 2009). In contrast, having fruit and vegetables available in the home is associated with an increase in fruit and vegetable intake (Larson et al., 2008). Increasing the accessibility to ready to eat healthy food in location and size at home, appears to increase fruit and vegetable intake (Baranowski, Cullen, & Baranowski, 1999). Alternatively, when soft drink is available in the home, adolescents are more likely to drink it more regularly (Kassem & Lee, 2004). Having healthier options available and accessible in the home, appears to support children and adolescents to eat healthier (Backman et al., 2002; Patrick & Nicklas, 2005).

Parental influences

Parental influences can play a positive role in adolescent healthy eating patterns. Adolescents that perceive their mothers to eat more fruit find it easier to eat more fruit themselves (Martens et al., 2005). The presence of at least one parent at evening meals is positively associated with a greater intake of fruit, vegetables and dairy foods (Videon & Manning, 2003). Parental beliefs and attitudes about eating are important in shaping their child's intake (Patrick & Nicklas, 2005). Support for healthy eating by parents during mid adolescence (15 years) is associated with increases in fruit and vegetable intake later in young adulthood (20 years) (Larson et al., 2008).

Parental modeling and parenting styles appear to influence food intake in adolescents. Perceived positive behaviour of the mother appears to be correlated with an increased adolescent consumption of fruit, ease to which adolescents feel they can limit high fat snacks and regular breakfast eating (Martens et al., 2005). Maternal concern for her personal healthy eating and maternal encouragement acts as protective factors against fast food intake in adolescents (Bauer et al., 2008). The mother appears to also be the most influential individual for prompting change in adolescents to eat a healthier diet (Backman et al., 2002). This depicts that parent behaviour and attitudes, particularly from the mother, play a significant role in the decision making process of adolescents in regard to their dietary behaviour. However, as adolescents seek independence, the contribution of parental modeling to their child's healthy food choices tends to decline with age, and the role of peers becomes more significant (Granner et al., 2004).

Peer influences

Adolescents tend to eat unhealthy snacks with friends, suggesting it is more socially acceptable to eat less healthy options (Hsieh, 2004). In fact, adolescents often feel it is embarrassing or 'uncool' to eat healthier if their peers are eating unhealthy food items (Croll et al., 2001). The pressure to conform to this becomes problematic to adolescent dietary behaviours (Giskes et al., 2005). Friends can play an important role in changing the types of foods that adolescents consume. When friends chose to eat healthy foods, adolescents have increased odds of lowering their fast food intake (Bauer et al., 2008). In comparison, adolescents who perceive a lower social expectation to eat a healthy diet tend to eat less fruit and vegetables (Lytle et al., 2003). In contrast, an expectation to eat breakfast regularly, improve fruit intake and limit high fat snacks by peers is correlated to more healthy behaviours (Martens et al., 2005).

Television viewing

High levels of television viewing is often related to a greater consumption of energy-dense, nutrient-poor foods (Matheson, Killen, Wang, Varady, & Robinson, 2004; Thomson, Spence, Raine, & Laing, 2008). Miller, Tavera, Rifas-Shiman and Gillman (2008) found that children who spent more time watching television appeared to consume a greater intake of sugar-sweetened beverages, fruit juice, milk, fast food, snack food and red and processed meats, and lower intake of fruit and vegetables. Similarly Coon, Goldberg, Rogers and Tucker (2001) found that children who eat meals in front of the television derive more of their total daily energy intake from meat (6%) and pizza, salty snacks and soda (5%), and less from fruit, vegetables and juice (5%), than children from families with a lower television use during meals. Longitudinal research has confirmed the negative influence of high television viewing to a reduced fruit and vegetable intake between mid adolescence (age 15) and young adulthood (age 20) (Larson et al., 2008).

Advertising

The documented link between television viewing and the consumption of extra foods appears to be attributed to the frequent advertising of these foods. Foods that are consumed whilst watching television appear to be the most highly advertised (Miller et al., 2008). In an analysis of the current advertising trends in Australia, Chapman, Nicholas and Supramaniam (2006) found that 81% of the total food advertisement on free-to-air television between 7 a.m. and 9 p.m. were unhealthy/non-core foods. An average of four unhealthy/non-core food advertisements appeared to be screened per hour, which equated to 4 four times the number of healthy food advertisements. Fast food had the greatest average number of advertisements shown per hour than any other food category (1.48), followed by chocolate and confectionary (0.65). In

contrast, food that is generally not consumed whilst watching television, such as fruit and vegetables, is advertised less (Chapman et al., 2006; Miller et al., 2008).

Timing of Extra Food Intake

Variations have been noted in research assessing food consumption and nutrient intake between weekdays and weekends (Nicklas, Farris, Bao, Webber, & Berenson, 1997). However, few studies have examined differences in food intake patterns between school days and the weekend in adolescents. Previous research has documented a greater energy intake on the weekend compared to the weekday in adults (Jula, Seppanen, & Alanen, 1999; Khare & Inman, 2009; Rhodes, Cleveland, Murayi, & Moshfegh, 2007). The increase in energy appears to be attributed to a greater fat intake, particularly from meals consumed at breakfast and dinner. Khare and Inman (2009) suggest that the main contributor to the increase in weekend intake is from lifestyle factors including unstructured eating behaviors, greater socializing, over eating and dining away from the home.

In a longitudinal study of European teenagers, adolescents aged 12-17 years had a greater energy intake, sugar intake and fat intake on weekends compared to school days (Post, Kemper, & Essen, 1987). Girls consumed more fat on school days whereas boys ate more on the weekend, but differences were noted with increasing age. Older females ate less carbohydrate with increasing age whereas boys consumed less protein at age 17-18 years compared to 12-13 year olds (Post et al., 1987).

In a study of American children, significant variations in fat intake between weekends and weekdays were observed (Cullen, Lara, & De- Moor, 2002). Fat intake was higher on the weekend compared to weekdays. A greater percentage of energy from fat was derived from

breakfast on Saturday and Sunday compared to other days. Other American researchers have found that in a study of children and television viewing, the percentage of energy intake was higher on weekends compared to weekdays (Matheson et al., 2004). Swedish research indicated that nutritionally poor snacks and less balanced meals are consumed frequently on the weekend by children (Sepp, Lennernas, & Abrahamsson, 2006).

In light of significant variations in dietary intake between weekday and weekend intake in adults, Jackson, Byrne, Magarey and Hills (2008) have emphasized the importance of collecting weekend data to capture a true representation of an individual's diet. Results of previous research illustrate the importance of considering weekday and weekend effects in dietary assessment (Rhodes et al., 2007). As limited research exists in this area, greater investigation, particularly with adolescents is required. Understanding the timing of unhealthy intake will be insightful for initiatives aimed at altering eating behavior.

Links between Extra Food Intake and Depressive Symptoms

Previous research has reported concerns associated with the intake of extra food. Firstly, a positive strong relationship has been found between soft drink and conduct problems and mental distress in Norwegian adolescents (Lien et al., 2006). A longitudinal study found that an increase in junk food at age four and a half years was linked with greater odds of hyperactivity at age seven (Wiles et al., 2009). Research investigating extra food intake in the context of the overall diet have found insightful results. Akbaraly et al. (2009) found that middle age women who had consumed a diet high in processed foods have a greater likelihood of depressive symptoms five years later. In Australian research, Jacka et al (2010) found that a 'western' style diet with unhealthy, processed food appears associated with greater odds of major depression or dystymia.

Western Australian researchers, Oddy et al., (2009) indicated that extra food intake is associated with social problems, withdrawal, anxiety/depression, attention problems, somatic problems, aggression and delinquency problems in adolescents age 14. This appeared to be the first evidence to suggest a possible relationship between extra food intake and depressive symptoms in adolescents. More recent research has replicated and extended these findings, reporting that increased odds of self reported symptoms of depression are associated with a greater consumption of unhealthy and processed foods in adolescents aged 10-14 years (Jacka, Kremer et al., 2010). Results indicated a dose response relationship between an unhealthy diet and a greater likelihood of depressive symptoms.

Methodological Issues

Considerations for school based research

Schools tend to be an ideal setting to collect information from young people (Farrington, McBride, & Midford, 2000). Schools are popular places to collect information about cigarette smoking, illicit drug use, risky sexual activity and emotional and well being issues because it is during high school that students appear to experiment with health risk behaviours (Hair et al., 2009). Therefore, schools provide researchers with access to a large sample of students of varying ages and are important places to implement school-based health promotion programs (Blom-Hoffman, Leff, Franko, Weinstein, Beakley, & Power, 2009). However, conducting research in schools appears challenging because of time constraints, ethical considerations, confidentiality and difficulties in obtaining active parental consent (Farrington et al., 2000). Research is often viewed as time intensive by many teachers and administrators, and it is not seen as a priority in a primary place of learning (Farrington et al., 2000). Therefore, developing the appropriate recruitment strategies is extremely important.

Research highlights that it is essential that research processes are matched to the school appropriately, and the relationship between the principal, staff members and research team is fostered (Farrington et al., 2000). Working directly with the principal and key staff is strongly recommended to gain support and endorsement for the study to run smoothly (Wolfenden, Kyri, Freund, & Hodder, 2009). Clear communication channels need to be established between the school, the child and the parent (Blom-Hoffman et al., 2009). In addition, reducing the workload of teachers and administrators is important, as is being flexible, ‘school friendly’, respectful and appreciative (Farrington et al., 2000). A key priority is ensuring that the school benefits from the research process and it is a positive and satisfying experience for all involved (Farrington et al., 2000).

Active consent versus passive consent

School based research requires active parental consent for participants to be involved in the study (Blom-Hoffman et al., 2009). Active consent is when parents are required to indicate their permission for their child to participate in the research. This is different to passive consent which only requires those parents who do not wish for their child to be involved in the study to respond (Esbensen, Miller, Taylor, Freng, & Freng, 1999). Active consent appears to provide parents with the information to make an informed decision, and tends to be a more respectful method of communication than passive consent (Blom-Hoffman et al., 2009). However, active consent is associated with a lower response rate and sample bias, can be costly and relies heavily on support from school staff and personnel.

Response rate

Research has found that active consent is typically associated with a lower response rate than passive consent. Eaton, Lowry, Brener, Grunbaum & Kann (2004) investigated the

differences in the response rate between schools using active and passive consent. Eighty six percent of schools reported a participation rate using passive consent compared to 34% using active consent. Similarly, Pokorny, Jason, Schoeny, Townsend and Curie (2001) found participation rate dropped from 86% to 55% when passive consent procedures were replaced with active consent procedures respectively. In contrast, other research has found the response rate using active consent to be greater than 76% (Esbensen, Melde, Taylor, & Peterson, 2008; Unger, Gallaher, Palmer, Baezconde-Garbanati, Trinidad, Cen et al., 2004). However, the higher response rate in active consent procedures in these instances appeared to be influenced by the methodology used to gain the consent.

The most common strategy for gaining active consent from parents is sending letters home (Blom-Hoffman et al., 2009). However, a number of limitations associated with the distribution of consent forms in the class room is acknowledged (Blom-Hoffman et al., 2009; Stein, Jaycox, Langley, Kataoka, Wilkins, & Wong, 2007; Tigges, 2003). Common issues include students forgetting to take the consent form home to their parents, forgetting to get the form signed or losing the consent form. This method also relies on supportive and motivated teachers to remind students to return their consent forms (Esbensen et al., 2008).

Strategies to increase interaction between research staff and students can be employed to motivate students to return their consent forms. Interaction between the researchers and students during school visits in class is believed to be important in assisting students to recognise the importance of the research project and increasing participation (Wolfenden et al., 2009). Assistance from school staff to remind students about the consent form at assembly is also recommended. If researchers can provide incentives to students, response rates are likely to increase (Blom-Hoffman et al., 2009; Esbensen et al., 2008; Ji, Pokorny, & Jason, 2004; Stein et

al., 2007; Tigges, 2003). Given the budget of small research projects, these incentives do not need to be extravagant but need to be suited to the target population (Elder, Shuler, Moe, Grieser, Pratt, Cameron et al., 2008). Fun and educational interactive items are appropriate and aid to raise awareness about the behaviours being researched.

Alternative methods to class room distribution of consent forms have also been investigated. In an American study of over 20,000 students in grade 7 to 10, Ji et al. (2004) found that a high active response rate resulted from attaching the consent form to another school form that parents had to sign. This approach was taken in other research in primary school children, but was distributed directly to parents at a parent information meeting (Stein et al., 2007). This procedure resulted in a substantially higher response rate than distributing forms to students in the classroom. However, attendance at parent information evenings in secondary school is typically low and the demographic representation may be bias. Ideally, researchers would send letters to the postal address of parents, however as this information is not available, attention needs to turn to better facilitating the process through distribution of forms in the classroom.

As mentioned, teachers can play a major role in active consent procedures and can increase the likelihood that a higher response rate is obtained. In a study of 45 000 middle school students, Esbensen and colleagues (2008) provide compensation and incentives to teachers for every student that returned their consent form in class. Although an overall active response rate was 79%, the cost associated with obtaining a high response rate is significant (\$27,144). In high budget research projects, costly strategies may be feasible, but for those with a low budget, it is simply not possible. If the costs associated with providing financial incentives to teachers are too significant, researches must seek alternatives to ensure that teachers are enthused and motivated throughout the research process (Farrington et al., 2000). Without the support of the teachers,

the response rate of the research project may be threatened. Furthermore, it is important that researchers acknowledge the work of the teachers throughout and at the completion of the research project in the appropriate ways. Allowing them to debrief about the research process is also important for reflection. This process is crucial in maintaining the relationship between the school and the University for further correspondence to take place in the future.

Active consent procedures do require time from school staff, and many schools see it as burden because of the resources required to gain consent (Pokorny et al., 2001). Following up missing consent forms can be difficult and costly, particularly with a large number of students and policies that permit the release of parental contact information (Blom-Hoffman et al., 2009). Furthermore, even when follow up procedures take place, participation rates may still remain low (Tigges, 2003).

Therefore gaining a high level of support from the principal and school administrators is an important strategy, given its association with higher response rates (Esbensen et al., 2008). Their involvement becomes critical when follow up procedures become necessary when the return of consent forms is low (Ji et al., 2004). Endorsement from the principal, through verbal communication or an attached letter with the consent has been recommended for recruiting students (Ji et al., 2004; Wolfenden et al., 2009). Therefore the initial contact with the school is important, and it is crucial that the ongoing communication throughout the research process is maintained. If researchers can afford to employ a project officer in the school, the building of these relationships can be adequately fostered and maintained. However, this is beyond the scope of many research projects and a greater focus on the planning efforts about alternative strategies is required to ensure that this relationship is formed. Either way, it is imperative that researchers

acknowledge and thank the school and principal accordingly and keep them informed about the results of the research project.

Sample bias

Another key concern associated with a low response from active consent procedures is sample bias (Blom-Hoffman, 2009; Ebeson, 2008). Active content procedures appear to affect the demographic characteristics of the sample. Research has indicated that students who return parental (active) consent are more likely to be female, live in two parents families and have parents with a high educational background (Esbensen et al., 2008). They are also more likely to be younger, male and have good grades (Courser, Shamblen, Lavrakas, Collins, & Ditterline, 2009; Unger et al., 2004). Parents from non-English speaking backgrounds or ethnic minority backgrounds are also likely to be underrepresented because they may not be able to communicate with school staff about the consent form effectively, may misunderstand the research purpose and consequently, not provide active consent (Blom-Hoffman et al., 2009).

Studies have also found that students who return their parental consent are also less likely to participate in health risk behaviours being researched (Esbensen et al., 2008; Tigges, 2003). Research found that students of parents who did not provide consent were at an increased likelihood of smoking tobacco, smoking marijuana and drinking alcohol, had negative perceptions towards their school environment and teacher (Courser et al., 2009; Unger et al., 2004). Some parents are already aware their child partakes in risky health behaviours and may not consent or students may be worried their survey responses will be shared with their parents and purposely discard the consent form (Unger et al., 2004). Therefore use of active consent procedures may be very detrimental in recruiting the participants of interest, including those already involved in risky behaviours (Esbensen et al., 2008). This may be damaging to the

credibility of the information collected to guide the implementation of preventative strategies (Blom-Hoffman et al., 2009; Stein et al., 2007; Tigges, 2003; Wolfenden et al., 2009).

Researchers have questioned the use of active consent procedures because they miss the participants in most need of intervention (Esbensen et al., 2008; Unger et al., 2004). Ensuring the parents are informed about the research objective and procedures in a clear and succinct manner is crucial. Furthermore having contact details of the research project officer on the consent form is important in providing opportunity for parents to question the child's participation in the research (Wolfenden et al., 2009). However, even when this has been completed, the response rate to active consent may remain low. Unger and colleagues (2004) reviewed consent procedures in relation to sample representation. Participants with implied (passive) consent complete a modified version of their smoking prevalence survey with limited, non-sensitive data, whereas participants with active consent completed a more extensive survey. When passive consent was included the overall consent rate increased to 91% and removed the bias associated with students purposely discarding the consent form because of their current risk behaviour. Unger et al. (2004) proposes that information from the implied consent can be used within the ethical conditions of human research. In light of this finding, if passive consent was to found plausible for minimal risk research projects, researchers must still uphold their duty of care to the participants and have the appropriate protocols in place to follow up on at risk responses.

Challenges of mental health research

School settings

Schools appear to be one of the most common places for young people to seek help for mental health problems (Sawyer et al., 2007; Slade et al., 2009). They are also an ideal place to

identify young people at risk of mental health problems, including depression (Ward, Sylva, & Gresham, 2010). However, given schools have limited resources to identify and constantly monitor the needs of their student population, students tend to be assessed on an individual basis only when they present with symptoms of a mental health problem (Dowdy, Ritchey, & Kamphaus, 2010). Consequently, many young people at risk of mental health issues, including high levels of depressive symptoms do not get identified. It is therefore important that strategies to collect information are implemented to ensure valid and reliable data can be used for designing prevention initiatives.

Active consent

Active consent is required by parent and participant for participation in mental health research. Active consent for mental health research allows parents and participants to make an informed decision about the participation in the research. Use of passive consent procedures in the screening of mental health has been criticized for violating privacy rights and parental rights by subjecting students to the screening without their parent's permission (Lenzer, 2005). As Jackson (2006) highlights, given active consent provides information about the intent, procedure and level of risk associated with the research project, and therefore provides the participant with an understanding to provide conscious or explicit permission to be involved, problems associated with privacy may be valid point. Use of passive consent in sensitive research has been deemed unethical, based on the premise that anyone under the age of 18 is a child and is incompetent to decide to decline or accept consent (Range, Embry, & MacLeod, 2001). Bessant (2006) argues that consent procedures based on age are problematic because young people under the age of 18 can be considered to have the capacity to make informed decisions, and protocols should be decided within context.

Researchers investigating mental health in adolescent population have a duty of care to their participants, which involves the protection of minors from harm (Shochett & O'Gorman, 1995). Therefore, in seeking active consent, parents and students must be made aware that if researchers discover survey responses that may indicate a health issue, appropriate methodological decisions need to be made, such as notifying the parents or appropriate school personnel (Langhinrichsen-Rohling, Arata, O'Brien, Bowers, & Klibert, 2006). This may ultimately affect the response rate and sample bias because adolescents are concerned about their responses being disclosed, and either purposely discard the consent form or consent, and not indicate their true behaviour (Langhinrichsen-Rohling et al., 2006). Alternatively, some adolescents may use the survey as a way to seek help based on the responses they indicate (Fisher, Higgins-D'Alessandro, Rau, Kuther, & Belanger, 1996). It is essential that the information delivered to parents and students is clear and succinct, and there is awareness about the significance of accurate data for the development of mental health initiatives.

Low response rate

School programs that aim to reduce the prevalence of depression in adolescents have historically demonstrated great variations in response rate. A Pennsylvania Depression Program for adolescents aged 10-13 years had an initial recruitment rate of 13 -19% (Jaycox, Reivich, Gillham, & Seligman, 1994). A slightly higher number of adolescents (50%) aged 14-15 years were recruited in a depression prevention study involving American high school adolescents (Clarke, Hawkins, Murphy, Sheeber, Lewinson, & Seeley, 1995). More recently Cuijpers, Boluijt and Van Straten (2008) indicated a response rate of 44% in research about screening for depression using the internet in a Dutch study involving adolescents.

In a study about alcohol use and depression among American youth, Magg and Irvin (2005) yielded a similar response rate of 41%. In this instance, consent forms were distributed to students in the classroom and teachers were asked to remind students to return their forms the two weeks prior to the commencement of the research. Other research has acknowledged the limitations associated with this procedure, and although they provided a further incentive to return the signed form, only a small number of American middle school (35%) and high school (38%) students provided active consent to the study (Newman et al., 2007).

Australian studies about mental health have reported higher response rates than research previously raised. Australian research investigating family risk factors associated with the onset and persistence of mental health problems has indicated a response rate of 60% in children (Dwyer, Nicholson, & Battistutta, 2003). In this instance, parents of children were mailed questionnaires directly, which in review is ideal. If implemented, this procedure would have to be completed by school administration staff, as privacy precludes this information from being disclosed in Western Australia. In a study of year 8 Australian high school students, Allison et al. (2001) indicated a response rate of 81% in research about gender differences in the relationship between depression and suicidal ideation. Jacka et al. (2010) reported slightly higher response rates in year six (92%) and year eight Australian students (89%) in a study about diet quality and depressed mood.

Researchers in other countries have also reported comparable responses in mental health and depression research. A relatively high response rate (83.5%) was obtained from researchers investigating sex differences in depressive and co-occurring anxiety symptoms in year six to 10 American students (Hankin, 2009). Hankin reported that consent forms were distributed in class time and students were compensated for their participation. This form of compensation does not

fall within the Department of Education and Training guidelines and therefore, cannot be conducted in Western Australia. A similar response rate was obtained in a study investigating the role of parental attributions to adolescent depressive symptoms in Canada (Chen et al., 2009). Chen used a combination of passive and active response procedures to yield a response rate of 75%. Following completion of a screening instrument by all students through passive consent, researchers used telephone calls and information evenings to obtain active consent for participation in diagnostic interviews for depressive symptoms.

Although confidentiality is assured in most research, some researchers may need to follow up on students that indicate concerning responses. Therefore, with knowledge of this, the low response rates in mental health research may be attributed to adolescents feeling ‘singled out’ from their peers if they indicate at risk responses (Shochet, Dadds, Holland, Whitefield, Harnett, & Osgarby, 2001). Alternatively, parents may be reluctant to consent because they are already aware their child has a mental health problem (Unger et al., 2004). Therefore it is important that parents are aware of the confidential nature of the information to the principle researcher, and the act of releasing information to the school psychologist or nurse will only be made with the best interest of the child in mind. Parents also need to be made aware that personal details of students are kept separate from the data to avoid identifiable information. These elements are crucial in ensuring that the response rate is as high as possible.

Questioning of sensitive issues

Mental health is a sensitive area involves screening devices that questions participants about their feelings regarding themselves, their parents and their peers. Researchers acknowledge that screening instruments can only be useful when people agree to complete it, and the nature of a mental health screening instrument may be perceived as being intrusive (Dwyer et al., 2003).

The level of distress caused to participation after being questioned about sensitive issues remains unclear. There appears to be a limited amount of research that has asked participants on the level of distress they experience when completing surveys about sensitive issues.

One research study found that most high school students (70.4%) did not experience psychological distress when answering questions (Langhinrichsen-Rohling et al., 2006). Langhinrichsen-Rohling and colleagues did report however that participants who had experiences related to the questions, such as suicide ideation or suicide attempt history were more likely to feel upset than those who had not. This was similar for participants of previous illicit drug use and physical or sexual abuse. These findings suggest that although distress may be apparent, it appears to be a function of the experiences they have endured and not a result of the survey. With this knowledge, it is important therefore that strategies are put in place in case students become distressed (Weist, Rubin, Moore, Adelsheim, & Wrobel, 2007). Having a clinician, such as a school nurse or school counselor briefed about the nature of the questionnaire or survey and available for debriefing is one strategy that may be effective.

The challenges of conducting research on mental health include a low response rate, sample bias and possible risk imposed on participants when questioned about sensitive issues. However, with responsible methodological procedures and appropriate support strategies in place, mental health research can be conducted in a constructive and ethical manner in adolescent populations.

Assessment of dietary intake

Understanding the advantages and disadvantages of various dietary assessment methods is important when selecting the appropriate method for your research purpose (Thompson &

Byers, 1994). The choice about which method to use is shaped by the suitability for the research objective and the desired analysis, the target group, timeframe, qualification and skills of the researcher, and the cost effectiveness to the research project (Biro, Hulshof, Ovesen, & Amorim Cruz, 2002). The primary methods for measuring food intake include food frequency questionnaires, diet history, dietary record, 24 hour recall and daily food checklist.

Food frequency questionnaires

The food frequency questionnaire (FFQ) asks the participant to indicate their consumption of food and beverages in a certain time period. FFQs can ask about a variety of foods and beverages or one specific nutrient, and vary between 50-150 items (Biro et al., 2002). FFQ can be administered easily and in a short period of time, and coded food items allow for simple interpretation of commonly consumed foods and beverages (Biro et al., 2002). They are also affordable and can be useful as a screening tool to assess the current and past diet (Thompson & Subar, 2001). The FFQ is appropriate in capturing an individual's usual intake and is useful for large population groups (Biro et al., 2002).

Reliability and validity

Previous research has evaluated the reliability of food frequency questionnaires with adolescents (Buzzard, Stanton, Figueiredo, Fries, Nicholson, Hogan et al., 2001; Marchioni, Voci, Leite de Lima, Fisberg, & Slater, 2007). In a study of 49 adolescents in Brazil, a food frequency questionnaire was tested for reproducibility and indicated fair reliability, however significant variations in energy with increased intake, and higher values in fat intake between the first and second administrations were observed (Marchioni et al., 2007). Other research has indicated that higher intakes appear to exist on the first questionnaire compared to the second

(Buzzard et al., 2001). Buzzard et al., (2001) found lower nutrient scores during the second administration of a brief FFQ testing fat, fiber and fruit/vegetable in sixth and seventh grade American students. In contrast, acceptable reproducibility (.62) between the first and second administration of a web-based FFQ was observed in Belgium adolescents (Matthys, Pynaert, De Keyzer, & De Henauw, 2007).

The validity of FFQs to collect usual food intake in adolescents has also been investigated (Ambrosini, Mackerras, de Klerk, & Musk, 2002; Papadopoulou, Barboukis, Dalkiranis, Hassapidou, Petridou, & Mougios, 2008; Slater, Phillipi, Fisberg, & Latorre, 2003) . Slater et al., (2003) validated a semi-quantitative food frequency questionnaire with 24 hour recall in Brazilian adolescents, and found similar values for energy, carbohydrate, fat and calcium intake, but variations in several nutrients, including protein and dietary fiber. Similarly, a semi qualitative questionnaire was validated with 3-day weighted record in Greek adolescents, and moderate to high correlations between the nutrients was indicated (Papadopoulou et al., 2008). In other research, a fair correlation (.54) between a FFQ and 24 hour recall has been observed in youth and adolescents age 9-18 years (Rockett, Breitenbach, Frazier, Witschi, Wolf, Field et al., 1997).

In contrast, other research has failed to report validity of FFQs. Cullen, Watson and Zakeri (2008) administered the Block Kids Questionnaire and two 24-hour dietary recalls within a 7-day period to American children and adolescents. Results indicated significant differences in percentage energy from carbohydrate, cholesterol, sodium and servings of vegetables, grains and milk products between the 24-hour recall and the Block Kids Questionnaire. The overall correlations between the two measures were low, suggesting further research is required to improve the validity. A FFQ validated with four 7-day diet records in Australian adolescents also

indicated poor agreement (Ambrosini et al., 2002). Ambrosini et al., (2002) found significant variations with a number intakes, inclusive of alcohol, fat, sugar and Vitamin C. In other Australian research, Watson, Collins, Sibbritt, Dibley and Garg (2009) investigated the comparative validity of a FFQ in children and adolescents aged 9 to 16 years against four assisted food records. Results indicated that the FFQ overestimated nutrient intakes, except carbohydrates, polyunsaturated fat, thamin, niacin and Vitamin C.

Although extensive research has been completed on the reliability and validity of FFQ, results have been inconsistent. Inconclusive findings associated with FFQ have been attributed to the limitations associated with this measure, including standard portion sizes, a lack of visual aids, a reliance on participants' ability to conceptualize aspects of their diet, and the extensive number of questions in the FFQ (Matthys et al., 2007). The key disadvantage associated with memory of intake may play a role in recalling the consumption of food and beverages in the specified time frame (Biro et al., 2002). In addition, as FFQs do not provide a valid estimate of absolute intake, and this measure was not appropriate for the current research.

Dietary history

A dietary history is a combination of a 24-hour recall, followed by a food frequency questionnaire and a 3-day dietary record (Biro et al., 2002). A diet history is appropriate for most population groups as it does not require a high amount of literacy. It appears useful for assessing intake of nutrients, meal patterning and food group intake (Thompson & Subar, 2001).

Reliability and validity

The diet history has been compared to an estimated 7-day food diary in the assessment of meal patterns and nutrient, energy and food intake in Sweedish adolescent girls (Sjoberg &

Hulthen, 2004). Sjoberg and Hulthen (2004) found a positive correlation (.63) between the diet history and the 7-day record for ranking energy intake of major food groups, energy and nutrients, inferring it is an appropriate reference method for assessment of diet. Other research involving Swedish adolescents also found the diet history to be a valid assessment (Sjoberg, Slinde, Arvidsson, Ellegard, Gramatkovski, Hallberg et al., 2003). Sjoberg et al. (2003) assessed the validity of a diet history with the Doubly labelled water (DLW) method, and found the diet history was a valid assessment of habitual intake.

Although time consuming, researchers have noted the appropriateness of the diet history to the adolescent population, as it avoided participant burden apparent in other dietary assessment measures (Sjoberg, Hallberg et al., 2003). However this method does rely heavily on qualified staff and the researcher of the current research was not equipped with the appropriate qualifications to administer the diet history. In addition, given the time required for this method, a diet history was not appropriate for a school setting.

Dietary record

A dietary record asks the individual to record the food and beverages as they consume it. A weighted method, which is the use of household measures to note the amount consumed, is considered the gold standard dietary assessment method (Biro et al., 2002). Estimated food records for 3 and 4 days are commonly used as reference methods (Matthys et al., 2007; Neuhouser, Lilley, Lund, & Johnson, 2009; Watson et al., 2009) Dietary records are reasonably accurate because food portions can be measured at the time of consumption and the chance of omission of food and beverages is limited (Thompson & Subar, 2001). This method is therefore appropriate for literate and motivated groups for the assessment of nutrients, meal patterning and food group intake.

Reliability and validity

A key strength of this method is the open ended nature to allow for the entire diet to be captured (Brunner, Stallonw, Juneja, Bingham, & Marmot, 2001). However, dietary records require well trained professionals and is time consuming. Furthermore, they rely heavily on the motivation and cooperation of the participant (Thompson & Subar, 2001). The burden on the participant increases as the number of record days increase, and this can alter habitual eating patterns (Biro et al., 2002). As it is self report, is it also subject to over or underestimation of food and beverages (Thompson & Subar, 2001).

In research involving adolescents, 7-day records appear to a high degree of under reporting compared to other methods, which is probably due to participant burden because participants are required to keep the food record with them (Sjoberg & Hulthen, 2004). Given the current research was with teenagers, the food record may be forgotten about, left at home and filled out inaccurately when the participant tries to complete the record days after the food or beverage has been consumed.

24 hour recall

A 24-hour recall is an interview in which the researcher asks the participants the type and quantity of food and beverages they have consumed in the previous 24 hours (Biro et al., 2002). This method relies on a well trained interviewer who is familiar with a range of food and beverages, and methods of preparation in specific regions or ethnic groups (Biro et al., 2002). As such, the interviewer can gauge reliable information from the participant without altering patterns of food intake. The interviewer also has the ability to clarify potential misunderstandings about timing of intake or portion size, instead of relying in written instructions that are

characteristic of other self report measures (Jain, Howe, & Rohan, 1996). A key advantage associated with 24-hour recall is that it does not rely on literacy and has a low burden on the respondent (Thompson & Subar, 2001).

Reliability and validity

It appears that validation studies for 24-hour recall are limited and previous research regarding the accuracy of this measure has reported inconsistent findings. A review of research involving 24-hour recall has found both an overestimation and underestimation of energy intake (Serdula, Alexander, Scanlon, & Bowman, 2001). In comparing the 24-hour recall to weighted records, Bingham et al., (1994) found that the 24-hour recall significantly overestimated energy, fat, protein and sugars. In comparison, Lytle, Nchman, Obarzanek, Glovsky, Montgomery, Nicklas et al., (1993) did not find any significant differences between dietary intake from observations and dietary intake from 24-hour recall in children.

In other research, a moderate level of agreement between 24-hour recall and a 3-day food record was found in weekday and weekend nutrient intake in adolescents (Mullenbach, Kushi, Jacobson, Gomez-Marin, Prineas, Roth-Yousey et al., 1992). The inconsistency in findings for this measure may be attributed to its heavy reliance on the participants' memory, and the associated difficulty in recalling portion sizes (Thompson & Subar, 2001). Although it appears to have some level of validity in estimating dietary intake, a single 24-hour recall is limited in representing the usual food and beverage intake of an individual (Biro et al., 2002).

Daily food recall checklist

A daily food checklist is a type of food record that asks participants to check the boxes next to the corresponding food and drink items. This method has a high level of specificity as it

allows the researcher to define the specific food and beverage items of interest by limiting the number included in the checklist (Kristal, Abrams, Thornquist, Disogra, Croyle, Shatruck et al., 1990). A daily food checklist appears advantageous over other food records because it has a reduced burden on the participant. In addition, compared to other food records, the daily food checklist does not appear to alter habitual eating patterns (Thompson, Subar, Brown, Smith, Sharbaugh, Jobe et al., 2002). To reduce the risk associated with misplacing or forgetting to complete the daily food checklist, which is common with other food records, researchers have adapted its use to into a 24 hour recall checklist which is better suited to children and adolescent populations within school settings.

Reliability and validity

Previous research indicates that daily food recall checklist is an effective assessment of dietary intake in adults (Kristal et al., 1990), adolescents (Caputsi, D'Alessandro, Castrogiovanni, Barale, & Morelli, 2002) and children (Kremer, Bell, & Swinburn, 2006). The effectiveness of a 24 hour food recall checklist was explored with an undergraduate student population for four days, including weekends (Comrie, Masson, & McNeill, 2009). Acceptable correlations were found between the food recall checklist and a food diary for most foods and nutrients, except alcohol and percentage energy from fat. A 24 hour recall checklist of food intake was also used to effectively determine mean iron intake of pregnant women (Zhou, Schilling, & Makrides, 2005). Validity of the 24 hour recall checklist was found through a good correlation coefficient (.69) with a diet history interview.

A daily food recall checklist that asks about consumption the day before appears to yield similar responses to those obtained in a 24 hour recall (Haraldsdóttir, Thórsdóttir, Vaz de

Almeida, Maes, Pérez-Rodrigo, Elmadfa et al., 2005; Kristal et al., 1990). Kristal et al., (1990) reviewed the validity of a Food Behaviour Checklist (FBC) with 24 hour recall in American adults. Although there did appear to be a tendency for participants to over report in the FBC compared to the 24 hour recall, the difference was not significant. Findings revealed the desirable and undesirable behaviours were more frequently reported on the FBC compared to the 24 hour recall (Kristal et al., 1990).

Furthermore, a 24 hour recall checklist included in one part of a food frequency questionnaire, was used in a European study to determine fruit and vegetable intake in 11 to 12 year old schoolchildren (Haraldsdóttir et al., 2005). Participants were questioned about their fruit and vegetable intake for each meal occasion of the previous day. No significant differences were observed for fruit and vegetable intake between the 24 hour recall checklist and a 1-day weighted food record. Despite this, overestimation of fruit and vegetable intake was evident in two of the four countries surveyed (Haraldsdóttir et al., 2005).

The effectiveness of a daily food checklist is dependent upon the number of days to estimate food and drink intake. The number of days collected through dietary assessment measures is important because of the day to day variability of an individual's dietary intake (Palaniappan, Cue, Payette, & Gray-Donald, 2003). Eck, Klesges, Hanson, Slawson, Portis and Lavasque (1991) report that 3 days of recall is generally accepted as an accurate representation of usual intake. Palaniappan et al., (2003) found that 2-6 days were required to estimate nutrient intake with good accuracy. In contrast, Jackson, Byrne, Magarey and Hills (2008) found that 8 days was required to achieve a true representation of dietary intake. An even greater number of days (n=21) is reportedly required to capture vitamin intake, particularly in girls (Livingston, Robson, & Wallace, 2004).

Generally, research indicates that a greater number of observations are necessary to collect estimates of usual nutrient intake than food group intake (Palaniappan et al., 2003). Also, because of the significant variations between weekend and weekday intake in boys and girls, it is recommended that weekend dietary intake data are included in dietary assessment (Cullen et al., 2002; Jackson et al., 2008; Matheson et al., 2004; Post et al., 1987; Sepp et al., 2006). Given time constraints in a school setting, the daily food recall checklist devised for the present research captured 7 days of intake, including 2 days on the weekend.

It has been acknowledged that recall of the portion size of food and intake in the previous 24 hours appears to be difficult, particularly in younger participants (Thompson & Subar, 2001). However, research has found that the inclusion of visual aids is important in assisting individuals to accurately recall the amount of food or drink they have consumed (Nelson, Atkinson, & Darbyshire, 1994; Nelson, Atkinson, & Darbyshire, 1996). Photographs on dietary measures may increase participant acceptance and interest, and reduce the likelihood of missing data (Small, Sidora-Arcoleo, Vaughan, Creed-Capsel, Chung, & Stevens, 2009).

Although photographs do appear useful to estimate the amount of food consumed, overestimation or underestimation may still be apparent because of the participants' difficulty to quantify certain types of foods. Therefore the errors made by participants in accurately quantifying foods may be a result of factors that cannot be controlled, including the ability to conceptualize portion size (Robson, Barbara, & Livingstone, 1999). Nevertheless, the inclusion of food photography appears to enhance the validity of a dietary measure to accurately collect dietary intake (Small et al., 2009). Consequently, the daily food recall checklist devised for this study included pictures of foods and portion size.

The appropriateness of this method to the present research results from a number of key factors. Firstly, a daily checklist has a high degree of specificity and only includes food and drink items of interest. Secondly, the question format is straight forward and can be structured to assist participants to recall their food and drink consumption through the inclusion of morning, afternoon and evening, and visual aids. Next, there does not appear to be any reported difficulty in remembering consumption from the previous day as 24 hours tends to be a simple time period to remember. Lastly, it is not time consuming or expensive, and therefore it is ideal for a school setting involving adolescents.

Conclusion

It appears that depressive symptoms increase at age 14-15 (year 10) and are more prevalent in girls than boys. There are a myriad of risk and protective factors at the individual, family and school level that impact the development and severity of mental health problems in adolescents. One of these factors is food. While nutritious food appears to offer some protection against depressive symptoms, unhealthy food may be a risk factor. To date, little research has considered the impact of extra food intake on the potential changes in the level and severity of depressive symptoms in adolescents aged 12-17. The most recent research investigated young people aged 10-14 and addressed the role of extra food in the diet of young adolescents and mental health.

Chapter 3: Methodology

This research is a correlational, comparative, cross sectional study, designed to investigate if a relationship exists between extra food intake and self-reported depressive symptoms in teenagers. The design allowed for the assessment of gender and year differences for extra food intake and depressive symptoms. Additionally, it allowed for the observation of differences between weekday and weekend extra food intake.

Participants and Setting

The sample for this pilot study comprised students in year 8 to 12 (age 12-17) from one middle socio-economic secondary school located in the Perth metropolitan area. Three hundred and thirty nine (n=339) participants were invited to participate in the study. This included 56 year eight students (age 12-13), 73 year nine students (age 13-14), 111 year ten students (age 14-15), 31 year eleven students (age 15-16) and 68 year twelve students (age 16-17). Depressive symptoms and extra food intake changes as young people progress through adolescence. Therefore, collecting information from year 8 to 12 provided the opportunity to detect changes over time.

Both boys and girls were invited to be part of the study. Although both girls and boys experience depressive symptoms, girls appear to report more than boys. Therefore, both boys and girls were recruited overall for comparison purposes between year groups.

The study was conducted between 24th May and 16th June of term 2 of the school academic year. Students completed the daily food recall checklist in class time each weekday over a week and the depressive symptoms questionnaire during class time the following week. Information letters were distributed to all students and parents, and active consent was obtained

from both student and parent before the student could participate. School teachers were responsible for the distribution of information letters and collection of the consent forms (Appendix 3). Students were reminded daily by the teacher to return their consent forms prior to the commencement of data collection.

Measures

The current research used two instruments to gather data, a daily recall food checklist for extra food intake and the Centre for Epidemiologic Studies Depression Scale (CES-D) for depressive symptoms (Radloff, 1977).

Daily food recall checklist

A daily food recall checklist measured extra food intake each day over a one week period. The daily food recall checklist included a series of extra food items that are common in adolescents' diets. The food items were grouped into take away food (hamburgers, pizza), party food (lollies, chocolate), snack food (sweet bun, cakes) and drinks (soft drink, milk shakes, energy drinks). These items were drawn from previous research involving children and adolescents (Abbott et al., 2007; Booth et al., 2004; Martin et al., 2009). The daily food recall checklist was modified from a daily food list developed by The National Cancer Institute (2009) of The United States National Institute of Health.

Reliability and validity

Previous research using food measures indicated that the daily food recall checklist provides acceptable reliability and validity when used with adolescents. This measure was available in a public domain and permission was obtained to adapt the measure to Australian adolescents. The effectiveness of a 24 hour food recall checklist has been explored with an

undergraduate student population for four days, including weekends (Comrie et al., 2009). Acceptable correlations ($>.50$) were found between the food recall checklist and a food diary for most foods and nutrients, except alcohol and percentage energy from fat. The 24 hour recall checklist of food intake was also used to effectively determine mean iron intake of pregnant women (Zhou et al., 2005). Validity of the 24 hour recall checklist was found through a good correlation coefficient ($.69$) with a diet history interview. Other research reviewing daily checklist has not found any significant differences between this measure and 24 hour recall (Haraldsdóttir et al., 2005; Kristal et al., 1990). Therefore, a daily food checklist for the previous day appears to be similar to responses to those obtained in a 24 hour recall (Haraldsdóttir et al., 2005; Kristal et al., 1990).

Content validity of the daily food recall checklist was assessed through consultation with professionals in the nutrition field who were confident that the daily food recall checklist was an appropriate measure to collect the daily intake of extra food. The daily food recall checklist was piloted with two year eight classes ($n=35$) to ensure the measure was valid for use with secondary school students. During the pilot, students were asked to complete the daily food recall checklist for extra food intake and then complete a record of all the food and drinks they had consumed in the previous 24 hours on another piece of paper. A significant positive correlation was obtained ($.875$) between the food and drink record and the daily food recall checklist, suggesting the daily food recall checklist is a reliable measure for collecting extra food intake.

The pilot also proved very beneficial in testing the format and content of the measure. Students were asked to raise questions about the daily food recall checklist to allow the measure to be reviewed and modified if necessary. As a result, changes were made, including a reduction

in the number of boxes for serving responses, the inclusion of food and drink items that commonly featured in the food and drink record but not the daily food recall checklist, and alterations to the wording of the serving times (morning, afternoon, evening). These changes were tested with another group of year nine high school students (n=4) to ensure it was clear and easy to complete.

The final format of the measure was simple, and was structured by time of the day and included visual aids to assist with the participant's recall of extra food for the previous day. The final version is attached as appendix 1.

Centre for Epidemiologic Studies – Depression Scale (CES-D)

The CES-D was used to collect self-reported depressive symptoms of secondary school students. The CES-D was originally constructed from a pool of items taken from validated depression scales (Radloff, 1977). CES-D is a short, structured, self report measure and has been designed for use in research that examines links between depression and other variables (Radloff, 1977). CES-D is a screening tool to measure a level of depressive symptomology and does not provide a diagnosis of clinical depression (Radloff, 1977).

The CES-D includes 20 items that align with the major components of depressive symptomology (Radloff, 1977). The items are modeled on four factors, including Depressed Affect, Well-Being, Somatic Symptoms and Interpersonal Relations. Participants are asked to respond to each item using a four-point scale based on their experience of each symptom in the past week. The scale ranges from 'rarely or none of the time (less than 1 day)' to 'most or all of the time (5-7 days)'. Four items are positively-worded to ensure participants have a greater attention to detail and they respond to each appropriately (Radloff, 1977). Each response is

weighted from 0 to 3 points and ratings are totaled to develop an overall score, ranging from 0-60 (Radloff, 1977). Higher scores indicate a greater level of depressive symptoms. The CES-D is attached as appendix 2.

Reliability and validity

The CES-D is a reliable and valid measure for depressive symptoms in adolescents. In a study of 2028 grade 8 Australian secondary students, Allison, Roeger, Martin and Keeves (2001) found acceptable internal consistency (.90) of CED-S scores. Similarly Chen et al (2009) found the CED-S to have adequate internal consistency (.94) in older adolescents aged 14-18. Test-retest reliability of the CED-S is also good (.54) in adolescent populations (Roberts et al., 1990). The CES-D had good criterion validity (.90) and has psychometrically sound properties for the subscales; depressed affect, positive effect, somatic and interpersonal (Phillips, Shadish & Murray, Kubik, Lytle & Birnbaum, 2006).

Levels of depressive symptoms

Gender specific cut-off scores for males (>22) and females (>24) from the total score have been constructed to indicate those adolescents who are at a great risk of depressive symptomology (Roberts, Lewinsohn & Seeley, 1991). Previous research that has used these cut off scores has indicated a prevalence rate of 10% (Hallfors, 2004). More recent studies have found the cut off scores to yield a prevalence rate between 16% and 17.5% for males, and 18% to 22% for females (Munafo et al., 2007; Sawyer et al., 2009). Australian research using a cut-off score of 24 for all students indicated a prevalence rate of 11% (Yap, 2008). Research involving Thai adolescents found a significantly higher rate (21%) using a cut-off score of 22 (Sukjai, 2007). The continued use of CES-D in current research within secondary school settings suggests

it remains an effective first-stage screening assessment for depressive symptoms (Sawyer et al., 2009; Audrain-McGovern, Rodriguez & Kassel, 2009; Chen, Johnston, Sheeber & Leve, 2009; Kercher, Rapee & Schniering, 2009; Yap et al., 2008).

The researcher also decided to assess the severity of depressive symptoms from the total score through the categories of minimal (0-15), mild (16-20), moderate (21-30) and severe (>30). Previous research that has applied these categories indicated important gender and year differences. An Australian study found that slightly more students were classified with moderate depressive symptoms (9.0%) than severe depressive symptoms (7.9%) (Allison et al., 2001). Allison et al. also reported that a higher percentage of girls (21.4%) than boys (13.2%) indicated moderate and severe depressive symptoms combined. Other research in Canada using these categories found that minimal depressive symptoms were lowest in year 7 and greatest in year 12 (Poulin et al., 2005). Furthermore the most severe depressive symptoms occurred in students 15 and 16 years of age.

Data Collection and Procedures

Data was collected from year 8, 9 and 10 over the first two weeks, and year 11 and 12 in the second two weeks. Six research assistants were employed to assist with collection of the extra food intake and administer the CES-D for self-reported depressive symptoms. All research assistants obtained a Working with Children Check, as per regulations of the Department of Education and Training. All research assistants attended training with the researcher regarding the set protocol for data collection and how to respond to questions. Each research assistant was provided with a written protocol outlining the instructions to students and answers to common questions.

Data collection took place between 9am and 3pm on school days. The daily food recall checklist and CES-D were administered to students during English classes, which were staggered at varying times of the day and varied for each grade level. The most appropriate time was negotiated with English teachers and the Head of English, at meetings prior to the commencement of the research. The daily food recall checklist took an average of 10 minutes to complete. The intake for the school week (Monday to Thursday) was collected each day for the previous 24 hours, whereas the intake for the weekend was collected on Monday for recall of Saturday and Sunday.

Research assistants entered the class room and distributed the daily food list at the beginning of the class. Research assistants instructed the class to create a unique alphanumeric code on the front of the daily food recall checklist, which was made up of their grade level, street number, birthday date and the first letter of their street name. The same code was placed on the front of every booklet that was completed during the week. Research assistants then asked students to turn the page to the morning section (breakfast to before lunch), and indicate yes or no to consuming breakfast. Students filled in the boxes corresponding to the number of servings for each extra food item they had consumed the previous day. Research assistants then asked students to indicate the food and drink items they had consumed during the afternoon (lunch to before dinner) and evening (dinner to before bed).

After students had completed their daily food recall checklist, they were asked to raise their hand for their daily food recall checklist to be collected. Following this, the research assistants returned to the staff room to tally the number of servings for morning, afternoon and evening. A composite score was then created for total extra food and each type of extra food.

This process was repeated for the collection of intake during the school week for Monday to Thursday. Overall, four weekdays were collected during the school week. When collecting weekend intake on Monday, students were provided with two booklets for Saturday and Sunday, and were asked to recall the extra food and drink intake they had consumed each day. They repeated the process of filling in the boxes for serving sizes for food and drink intake on Saturday and Sunday, separately. Consequently, weekend intake recorded on Monday took slightly longer.

Once all the data was collected, a total mean score was calculated for each student. The means of all students were summed and averaged to create an overall mean intake. This process was repeated for weekday, weekend, and type of extra food.

The following week, the CES-D for depressive symptoms was completed. Research assistants asked students to place their alphanumeric code at the top of the questionnaire. Research assistants instructed students to complete the CES-D by responding to each item with 'rarely' to 'most of the time'. On the day of this questionnaire, students were handed information from Beyond Blue about depression. Students were informed that the school nurse was available for debriefing if they felt they required it. Following the CES-D, scores were summed and reviewed. Any scores above the recommended cut-off scores were given attention, and the responses were discussed with the school nurse. Following this, a letter was sent home to parents expressing concern for their child's responses, and recommending they consult their general practitioner for further information. If parents sought further clarification, the school nurse was available and enquiries were forwarded to her.

Treatment of Data

Some data for extra food was missing, however averages were calculated based on the number of days collected, therefore missing information did not affect the total intake. Missing data for depressive symptoms was unavoidable as this information was only collected on one day, and therefore it was not appropriate to substitute missing values from one day of collection for participants who were absent. This missing information did not impact on the analyses.

Categorical variables were created for depressive symptoms. A gender specific cut-off score was created for girls (>24) and boys (>22) to identify those participants at a greater risk of depressive symptoms. Categorical variables were also created for minimal (0-15), mild (16-20), moderate (21-30) and severe (>31) to identify the severity of depressive symptoms. Years were recategorised into year 8 and 9, year 10 and year 11 and 12. As there was a small sample size ($N=122$), the statistical power to reject the null hypothesis was limited. Therefore, by grouping years together into 3 categories, the sample for each year group was increased and therefore, so too was the chance of statistical significance between groups. Previous research has also used these categorical variables to group years, and therefore comparisons can be made between the research and this study (Audrain-McGovern et al., 2006; Cuijpers et al., 2008; Poulin et al., 2005).

Data Analysis

SPSS version 17.0 was employed for all data analysis. Firstly, the data was tested for normality for extra food intake and depressive symptoms. When analysed, the distribution of the values was skewed, therefore as the assumptions for parametric tests were violated, non parametric tests were performed. Non parametric tests are suited to small sample sizes, because

they rank the scores and used to median to detect any significant differences. Parametric tests are also immune to outliers, and therefore the influence of outliers in the data is minimal.

Descriptive analyses were determined for extra food intake servings and depressive symptom total score. Mean values and standard deviations were investigated and reported to demonstrate patterns of extra food intake and depressive symptoms across year groups in girls and boys. A Man-Whitney Test was performed to compare the median scores between girls and boys overall, and at each year group for depressive symptoms and extra food intake. A Kruskal-Wallis Test was conducted to compare median scores between year groups for depressive symptoms and extra food intake.

Scores for depressive symptoms were treated as both a continuous and categorical variable. Extra food intake was treated as a continuous variable, the higher the number of servings, the greater the intake.

To compare weekday and weekend extra food, a linear mixed model was employed. Field (2009) acknowledges that this type of model is useful for continuous outcome variables and is suitable for repeated observations and is immune to missing data. The assumption of normality is also not critical for the use of a linear mixed model. Therefore, it was an appropriate selection for analyses of timing of intake in this study because of the repeated observations of weekday and weekend intake for each participant. This maximized the use of the data even if participants had weekday or weekend intake missing.

A linear mixed model was also performed to determine if a relationship existed between depressive symptoms (dependent variable) and extra food intake (independent variable). This type of model is useful in determining the best predictor (gender, year or timing of intake) of a

continuous outcome variable (depressive symptoms) Firstly, year and gender were entered to analyse their contribution to depressive symptoms. Next, mean weekday and weekend intake was combined to investigate the contribution of total extra food intake to depressive symptoms. Mean weekday and weekend intake was then entered separately as independent variables to determine which of the two, was the best predictor of depressive symptoms. Each type of extra food (take away food, drinks, party food and snack food) was then added to analyse the specific type of food that best predicts depressive symptoms. Fixed effect and interaction structures were investigated to determine the final model.

Ethical Clearance

The current research was granted permission from The University of Notre Dame Human Research Ethics Committee. The Department of Education and Training also approved the study. The principal of the chosen secondary school granted permission for the research to take place, following consultation with the school nurse and meetings with Head of English, and English teachers.

Active consent was obtained from parents or guardians of students wishing to participate in the study and the students. A detailed information letter was distributed to parents and students, informing them about the rationale, significance and procedure of the research study, and recommending they discuss their participation with each other before offering their consent. The information letter also highlighted that students have a right to withdraw at any time and that a code will be used to avoid any names being used on the daily food list and CES-D (See Appendix 3).

Thorough consideration has been given to ethical issues associated with research on adolescent depression (Shochett & O'Gorman, 1995). The study of any mental health issue is a sensitive area and the current research did not intend to cause distress to participants. It was anticipated that the CES-D would identify participants presenting a range of depressive symptoms. Therefore an appropriate protocol was established to respond to this situation. The protocol described below was developed in consultation with a Consultant Child and Adolescent Psychiatrist at the Psychological Medicine Clinical Care Unit, Princess Margaret Hospital.

The CES-D has a cut-off score that delineates a level of symptomology associated with depression. If participants' responses indicated a score above this level, parents of the students were informed. The address of the parents was asked for in the consent form. The letter suggested that the parent seek additional information from their general practitioner.

Additionally, all students were provided with flyers from Beyond Blue about adolescent depression and a card with help lines and support services. The school nurse was also available for support to students and parents for debriefing following the survey. The letter is attached as Appendix 4.

Chapter Four: Results

This chapter reports the response rate and the responses to the CES-D questionnaire (depressive symptoms) and the daily food recall checklist (extra food intake). For depressive symptoms, the total score, category by cut-off score and category by minimal, mild, moderate and severe are reported. For extra food intake, the amount (number of servings) and type (take away food, drinks, party food and snack food) of extra food intake (weekday and weekend) are reported. Difference in depressive symptoms due to extra food intake was examined by school year, gender, and weekday and weekend intake. All possible interactions were examined.

Response Rate

This study had a response rate of 37%. A total of 125 participants provided active consent to participate including 19 year eight students, 21 year nine students, 43 year ten students, 21 year eleven students and 23 year twelve students. Poor quality daily food lists and missing data excluded 3 participants, bringing the total number to 122 participants in year 8 to 12. Table 1 shows the breakdown of the total participants by year and gender. Obtaining active consent from students within the school setting proved to be difficult in this study, despite constant reminders from the class teachers and the distribution of extra copies of consent forms. This low response rate has impacted on overall power to detect significant differences.

Table 1

Total participants by year and gender.

	Year 8 & 9	Year 10	Year 11 & 12	Total
	(12-14 years)	(14-15 years)	(15-17 years)	
Girls	22	18	28	68
Boys	17	22	15	54
Total	39	40	43	122

Depressive Symptoms

Total score for depressive symptoms

Due to the small sample size, distributional assumptions could be violated. The mean and standard deviation is reported to demonstrate patterns of extra food intake but statistical tests to determine year and gender differences were based on the median.

Patterns in depressive symptoms (mean)

Figure 2 reports the mean values for CES-D total score for girls and boys across all year groups. Overall, the mean total score was 12.51 ($SD=7.33$) from a possible score range between 0 and 60.

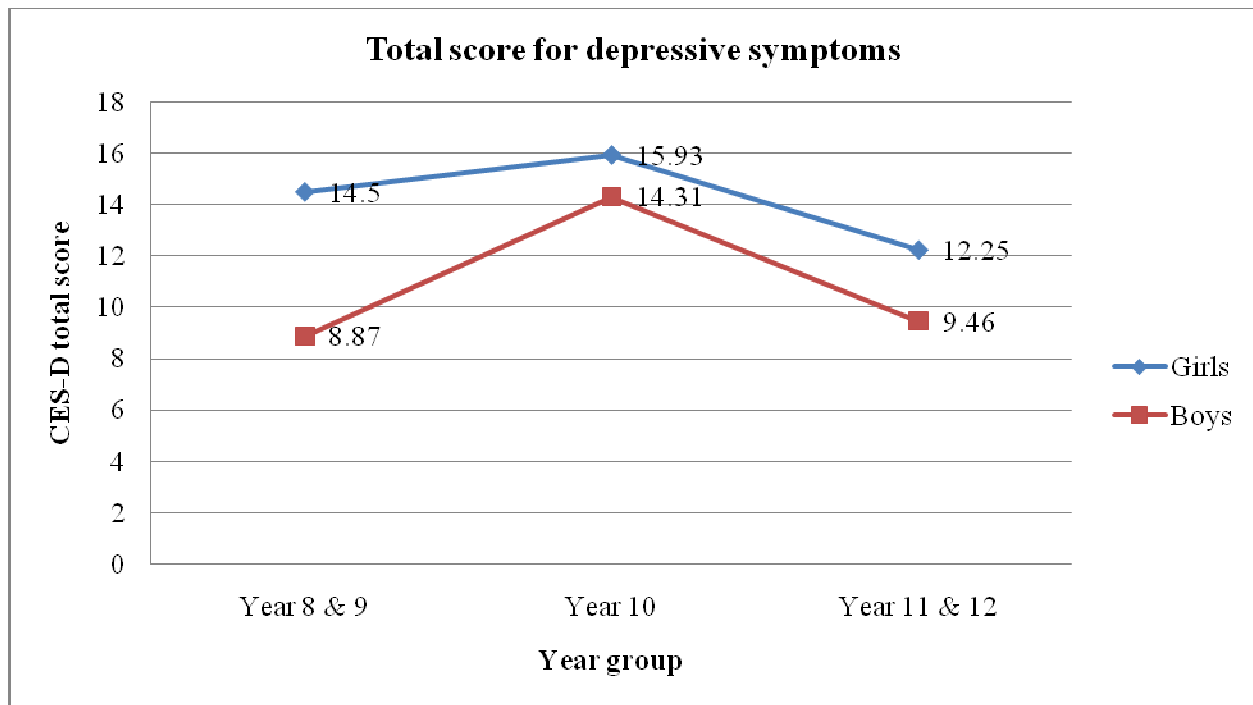


Figure 2. Mean depressive symptoms total score for girls and boys across each year group.

For boys and girls combined, the mean score (M) appeared to increase from year 8 and 9 ($M=11.37$, $SD=6.83$) to 10 ($M=15.07$, $SD=8.25$), and declined in year 11 and 12 ($M=11.27$, $SD=6.49$). The pattern of depressive symptoms between males and females appeared different. For females, the mean total score remained high from year 8 and 9 ($M=14.50$, $SD=5.67$) to year 10 ($M=15.93$, $SD=8.87$) and declined slightly in year 11 and 12 ($M=12.25$, $SD=6.15$). For males, the mean total score increased dramatically from year 8 and 9 ($M=8.87$, $SD=6.74$) to year 10 ($M=14.31$, $SD=7.89$), followed by a greater decline in year 12 ($M=9.46$, $SD=6.96$).

Year differences (median)

Table 2 reports median values for CES-D total score for year and gender. No significant differences between the total score for depressive symptoms was indicated between year groups

with girls and boys combined ($p = .08$). For boys, a significant increase in depressive symptoms was reported between year 8 and 9 ($Mdn = 7.00$) and year 10 ($Mdn = 14.50$, $p = .02$)

Gender differences (median)

A Mann-Whitney Test was conducted to explore any significant differences in total score for girls and boys with all year groups combined. Table 3 shows the total score for depressive symptoms in girls ($Mdn = 12.50$) was significantly higher than boys ($Mdn = 8.50$, $p = .02$). When year 8 and 9 girls were combined ($Mdn = 14.50$) and compared to boys ($Mdn = 7.00$), there was a significant difference ($p < .01$).

EXTRA FOOD INTAKE AND DEPRESSIVE SYMPTOMS IN ADOLESCENTS

Table 2

Median scores for CES-D for girls and boys across all year groups

Year 8 & 9					Year 10				Year 11 & 12				Total			
(13-14 years)					(15 years)				(16-17 years)							
Total	Girls	Boys	Sig		Total	Girls	Boys	Sig	Total	Girls	Boys	Sig	Total	Girls	Boys	Sig
n=39	n=22	n=17			n=40	n=18	n=22		n=43	n=28	n=15		n=122	n=68	n=54	
CES-D	10.00	14.50	7.00	<.01	15.50	17.50	14.50	ns	9.00	11.00	8.00	ns	11.00	12.50	8.50	.02

Level of depressive symptoms (cut-off score)

The total score was categorised by gender specific cut off scores (females >24, males >24) to delineate students at a greater risk of depressive symptoms.

Year differences (median)

The percentage of students who scored above the cut off score for year 8 and 9 was 7.4%, for year 10, 6.7%, and for year 11 and 12, 5.4%. This was not significant (*Fishers exact p* = .990).

Gender differences (median)

There were no significant differences between the percentage of boys (6.0%) and girls (6.8%) that scored above the cut off score ($p = .871$). Of the 6.8% of girls with scores above the cut off, their minimum value was 29 with a maximum of 37. Of the 6% of boys with scores above the cut off, their minimum value was 25 with a maximum of 33.

Severity of depressive symptoms (minimal, mild, moderate & severe)

The total score for depressive symptoms was categorised as minimal, mild, moderate and severe depressive symptoms to indicate the severity of depressive symptoms. Figure 3 and 4 demonstrate the percentage of students within each category by year and gender respectively. Based on their total score, most students (71.3%) were classified having minimal depressive symptoms (0-15), 11.7% were classified as mild (16-20), 14.9% moderate (21-30) and 2% severe (>31).

Year differences

Figure 3 shows the proportion of students in year 8 and 9, 10 and 11 and 12, identified as having minimal, mild, moderate and severe depressive symptoms.

Years 8 and 9 had the greatest proportion of students (81.4%) that were classified as having minimal depressive symptoms and they also had the smallest proportion of students (7.4%) classified as having moderate depressive symptoms. Year 10 students had the greatest proportion of students that were classified as having mild depressive symptoms (23.3%) and moderate depressive symptoms (20.0%). Year 10 was also the only year to have students (6.7%) classified with severe depressive symptoms.

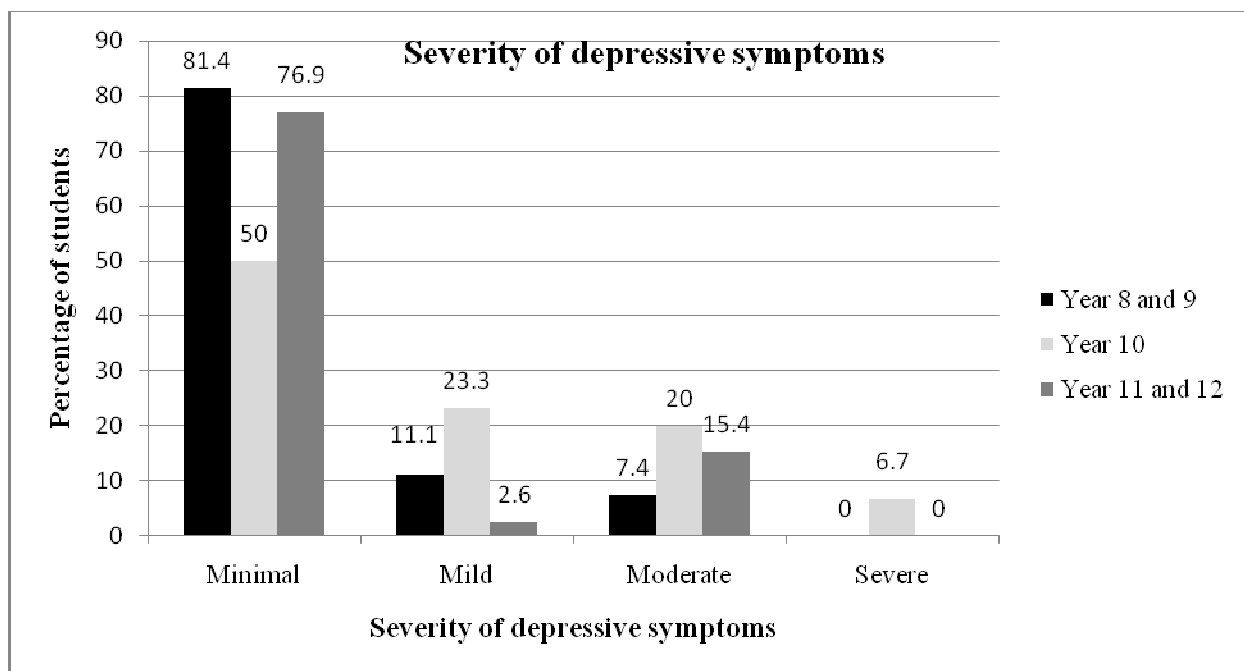


Figure 3. Percentage of students categorised with minimal, mild, moderate and severe depressive symptoms for year 8 and 9, year 10, and year 11 and 12.

Gender differences

Figure 4 demonstrates the proportion of girls and boys that were identified as having minimal, mild, moderate and severe depressive symptoms.

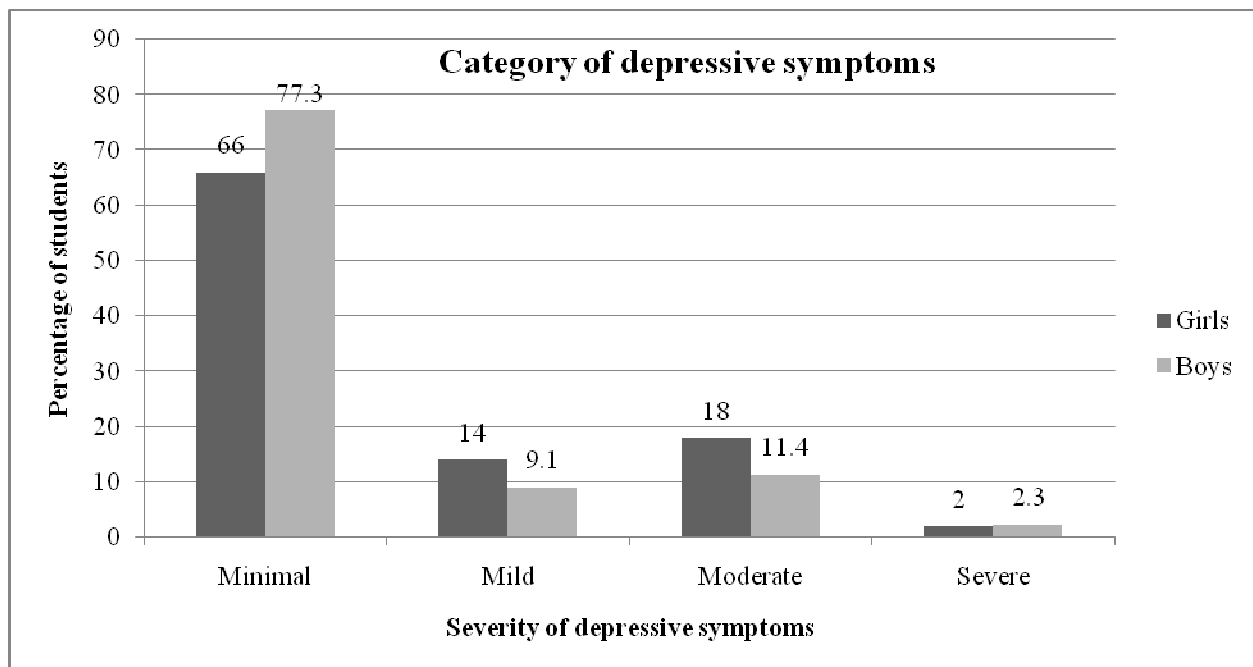


Figure 4. Percentage of students categorised with minimal, mild, moderate and severe depressive symptoms for boys and girls.

A greater proportion of girls (20.0%) than boys (13.7%) were classified as having moderate or severe depressive symptoms. More boys (77.3%) than girls (66.0%) were classified as having minimal depressive symptoms but more girls (14.0%) than boys (9.1%) were classified as having mild depressive symptoms. In every year group, more boys than girls were classified as having minimal depressive symptoms, but more girls than boys were classified as having moderate depressive symptoms.

Extra Food Intake

Total extra food

The mean and standard deviation is reported to demonstrate patterns of extra food intake but statistical tests to determine year and gender differences were based on the median.

Patterns of extra food intake (mean)

Figure 5 reports the mean servings of extra food for girls and boys across all year groups. The total mean value for each day was 8.08 ($SD=13.10$) servings.

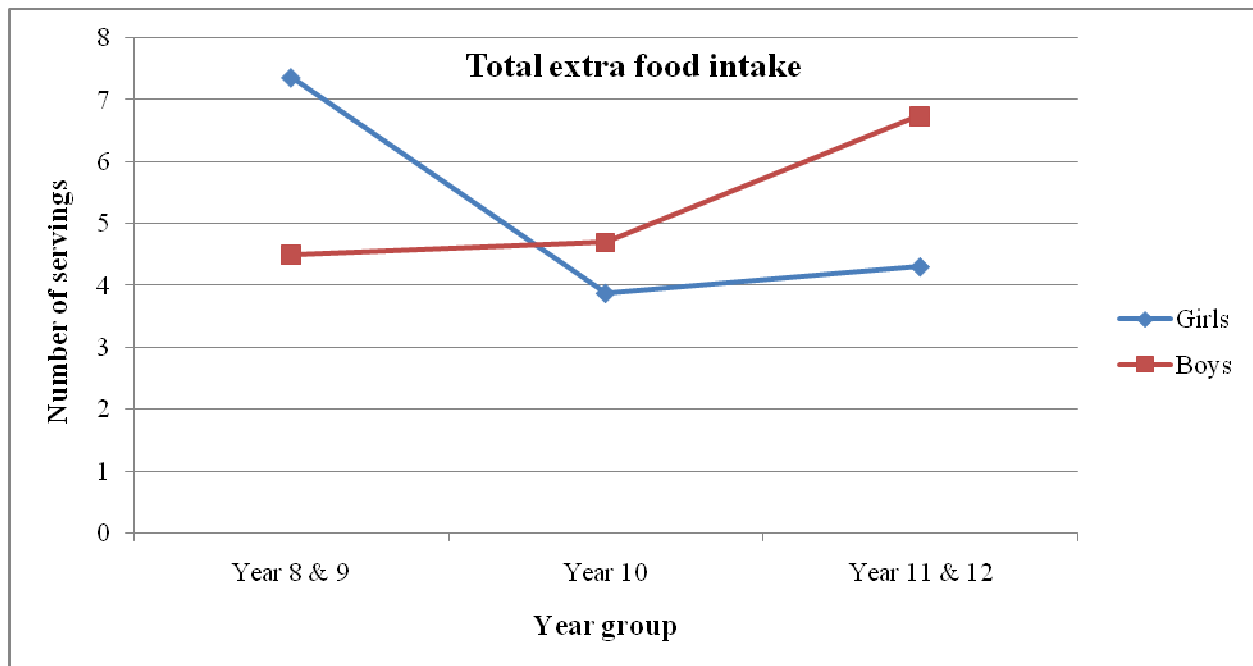


Figure 5. Mean servings for total extra food intake for girls and boys across each group.

Girls appeared to consume more than boys in year 8 and 9 ($M=7.45$, $SD=20.84$), and year 11 and 12 ($M=7.78$, $SD=18.22$), but less than boys in year 10 ($M=4.98$, $SD=5.10$). Overall, girls consumed more servings of extra food ($M=9.49$, $SD=16.95$) than boys ($M=6.30$, $SD=4.76$).

Year differences (median)

When servings of extra food were compared between year 8 and 9 ($Mdn=5.50$), year 10 ($Mdn=4.38$), and year 11 and 12 ($Mdn=4.30$) with girls and boys combined, a Kruskal-Wallis Test did not indicate significant differences between year groups ($p=.56$)

Gender differences (median)

Servings of extra food did not differ significantly between boys ($Mdn=5.00$) and girls ($Mdn=4.67$, $p=.89$).

Type of extra food

The mean and standard deviation is reported to demonstrate patterns for each type of extra food but statistical tests to determine year and gender differences were based on the median.

Patterns of each type of extra food (mean)

Figure 6 demonstrates the mean servings for girls and boys combined across all age groups for each type of extra food. The mean servings for take away were 1.72 (2.54), 1.93 (2.24) for drinks, 1.44 (1.39) for party food and 1.46 (1.57) for snack food.

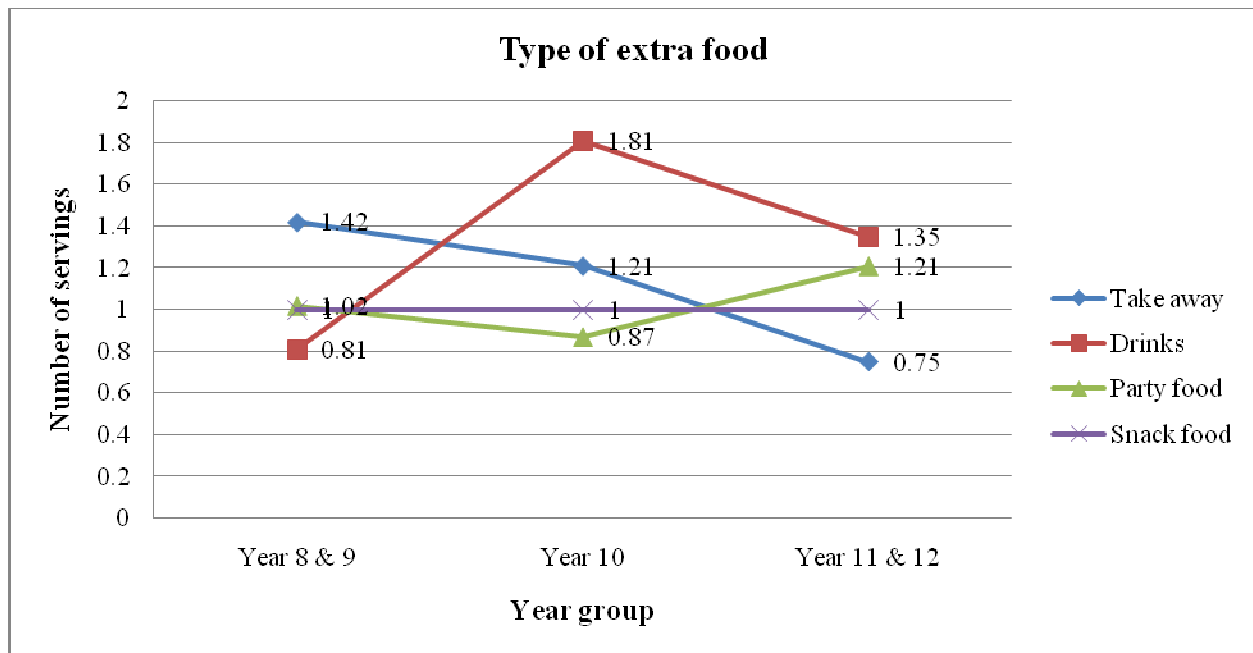


Figure 5. Mean servings for each type of extra food for each year group.

Overall, different patterns emerged for each type of extra food. More servings of take away were consumed in year 8 and 9 ($M=2.15$, $SD=3.38$) compared to year 11 and 12 ($M=1.70$, $SD=2.47$). Similarly, more snack food was consumed in year 8 and 9 ($M=1.62$, $SD=1.66$) compared to year 11 and 12 ($M=1.25$, $SD=1.38$). Drinks appeared to increase from year 8 and 9 ($M=1.86$, $SD=2.04$) to 10 ($M=2.24$, $SD=2.84$), and declined by year 11 and 12 ($M=1.72$, $SD=1.75$). Party food remained relatively unchanged across the different year groups (Table 3).

Different patterns between genders were also observed. In girls, mean servings appeared to decline from year 8 and 9 to year 11 and 12 overall for take away food, party food and snack food, whilst drinks remained consistent. In boys, the servings for take away and party food appeared to increase across the year groups. Drinks and snack food appeared to peak in year 10, and decline by year 11 and 12.

Year differences (median)

Table 3 shows the median values for each type of extra food for gender and year. A Kruskal-Wallis Test for total servings was conducted to determine any significant difference between year groups for each extra food group. No significant differences were observed between year groups for take away food ($p = .32$), drinks ($p = .85$), party food ($p = .63$) or snack food ($p = .43$).

Gender differences (median)

A Mann-Whitney Test was conducted to explore gender differences in servings between girls and boys for each type of food group. No significant differences were indicated for servings of take away, drinks, party food or snack food between males and females for all years combined. However, as Table 4 shows, more girls in year 8 and 9 combined, consumed more take away food, ($p = .04$) party food ($p = .01$) and snack food than boys ($p = .04$). In year 11 and 12 combined, boys consumed more take away food than girls ($p = .03$) but girls consumed more snack food than boys ($p = .03$).

EXTRA FOOD INTAKE AND DEPRESSIVE SYMPTOMS IN ADOLESCENTS

Table 3

Median values for each type of extra food for girls and boys across all year groups

	Year 8 & 9				Year 10				Year 11 & 12				Total			
	(12-14 years)				(14-15 years)				(15-17 years)							
	Total	Girls	Boys	Sig	Total	Girls	Boys	Sig	Total	Girls	Boys	Sig	Total	Girls	Boys	Sig
	n=39	n=22	n=17		n=40	n=18	n=22		n=43	n=28	n=15		n=122	n=68	n=54	
Take away	1.42	1.75	1.00	.04	1.21	.96	1.25	NS	.75	.38	2.00	.03	1.25	1.00	1.25	NS
Drinks	.81	.75	1.68	NS	1.81	1.10	2.18	NS	1.35	1.33	2.00	NS	1.35	1.09	2.00	NS
Party food	1.02	1.88	.88	.01	.87	1.28	.78	NS	1.21	1.16	1.33	NS	1.00	1.32	.88	NS
Snack food	1.00	1.25	.63	.04	1.00	.75	1.73	NS	1.00	1.00	.25	.03	1.00	1.03	1.00	NS

Timing of Intake

Timing of total extra food intake

Table 4 demonstrates more extra food was consumed on the weekend compared to the weekday in every year group by girls and boys combined. A linear mixed model analysis did not indicate a significant difference between weekend ($M=3.67$, $SD=3.73$) and weekday intake ($M=3.10$, $SD=2.54$, $p=.18$) for boys and girls in all years combined. Younger girls in year 8 and 9 consumed more extra food on the weekday and weekend than younger boys, but older boys in year 10 to 12 tended to consume more extra food on weekday and weekend than older girls. No significant differences were observed between boys and girls in each group or between year groups with boys and girls combined.

Table 4

Mean values for extra food weekday versus weekend for girls and boys across all year groups

	Year 8 & 9 (12-14 years)			Year 10 (14-15 years)			Year 11 & 12 (15-17 years)			Total		
	Total	Girls	Boys	Total	Girls	Boys	Total	Girls	Boys	Total	Girls	Boys
	n=39	n=22	n=17	n=40	n=18	n=22	n=43	n=28	n=15	n=122	n=68	n=54
Weekday	2.94	3.27	2.53	3.05	2.98	3.31	3.31	3.08	3.70	3.10	3.11	3.09
Weekend	4.23	5.38	2.80	3.39	3.12	3.46	3.39	3.15	3.78	3.67	3.96	3.33

Timing of intake for each type of extra food

Each type of extra food was entered into a linear mixed model to explore differences in the timing of intake. The mean values are shown in Table 5.

Table 5

Mean values for type of extra food weekday versus weekend for girls and boys with all year groups combined

		Girls	Boys	Total	Sig
		n=68	n=54	n=122	
Take away	Weekday	.67	.73	.70	NS
	Weekend	1.17	.97	1.77	.05
Drinks	Weekday	.73	.90	.81	NS
	Weekend	1.12	1.27	1.19	.02
Party food	Weekday	.71	.78	.75	NS
	Weekend	.92	.51	.73	NS
Snack food	Weekday	.91	.74	.83	NS
	Weekend	.74	.56	.66	NS

Significantly more servings of take away were consumed on the weekend ($M=1.07$, $SD=1.77$) compared to the weekday ($M=.70$, $SD=1.10$, $p=.05$). Findings also indicated that a significantly greater number of drinks were consumed on the weekend ($M =1.19$, $SD =1.47$) compared to the weekday ($M=.81$, $SD=.97$, $p=.02$). More snack food appeared to be consumed on the weekend compared to the weekday, but this was not significant. No differences were observed in the number of servings of party food between weekend and weekday.

Depressive Symptoms and Extra Food Intake

A linear mixed model was performed to determine if a relationship exists between extra food intake and depressive symptoms. Depressive symptoms were entered as the dependent variable and total extra food, take away, drinks, party food and snack food were entered as factors (main effect). Age, gender and day of the week were also treated as factors (main effect). Interactions of total extra food and each type of food group with year and age were also investigated.

Gender as a main effect was significant. Findings revealed that girls have a greater risk of depressive symptoms than boys ($p = .03$). Year as a main effect was also significant. Year 10 students were at a greater risk of depressive symptoms than any other year group ($p= .02$).

Findings indicated that total extra food intake was not significantly related to depressive symptoms ($p = .87$). However, after investigation of each type of food, drinks approached significance ($p=.08$). When year was entered as a main effect, drinks became statistically significant ($p=.03$) When the types of drinks, gender and year were entered into the model as main effects, girls ($p= <.01$) and year 10 students ($p=.05$) who consumed cordial were at a greater risk of depressive symptoms.

Significant interactions with depressive symptoms were also apparent for soft drink in year 8 and 9 ($p=.04$), and diet soft drink ($p<.01$) and milkshakes ($p=.04$) in year 10. Furthermore, take away consumption in year 9 ($p=.05$) and year 11 and 12 ($p<.01$), snack food consumption in year 8 and 9 ($p<.01$) and 10 ($p=.04$), and party food in year 11 and 12 ($p<.01$) were also indicated to be significant to depressive symptoms.

A significant interaction was found for the fixed effects of total extra food and timing of intake ($p=.03$), take away food and timing of intake ($p=.01$), drinks and timing of intake ($p=.03$) and gender and timing of intake ($p=.04$). Data revealed that total extra food consumption on the weekend, take away food on the weekend and females consuming extra food on the weekend were significant predictors of depressive symptoms.

In light of these findings, several conclusions from this study can be made. Girls and year 10 students are at a greater risk of depressive symptoms. Additionally, year 10 girls who consume cordial also appear to be at higher risk of depressive symptoms. The consumption of more extra food on weekends, particularly take away and drinks is significantly associated with depressive symptoms, particularly in older boys. Furthermore different types of drinks and different types of extra food appeared to be related to depressive symptoms in specific year groups.

Chapter Five: Discussion

This chapter begins by discussing the response rate and then reports the following key findings related to the major research questions of this study. Gender and year differences in depressive symptoms are discussed, followed by extra food intake, including findings related to gender, year and weekday versus weekend intake. Lastly the association between extra food and depressive symptoms is considered.

Low Response Rate

This study had a low response rate of 37%. This was anticipated due to findings of previous research related to mental health and young people using active consent (Allison et al., 2001; Chen et al., 2009; Clarke et al., 1995; Dwyer et al., 2003; Hankin, 2009; Jaycox et al., 1994; Magg & Irvin, 2005; Newman et al., 2007). The response rate for other studies of this age group ranges from 40 to 79% (Magg & Irvin, 2005; Woo et al., 2004). Active consent was required from students and parents, and this is typically associated with a lower response rate.

This research was conducted in a school setting, and consent forms were distributed in class. Whilst this strategy relies on motivated teachers, and is associated with students either forgetting to take their consent form home, forgetting to get the consent form signed by parents or losing the consent form, alternative methods such as offering incentives for participation or directly sending letters to parents are often very costly or rely heavily on school administration staff to administer (Blom-Hoffman et al., 2009; Esbensen et al., 2008; Stein et al., 2007; Tigges, 2003). Furthermore, privacy protocols and the Department of Education Training guidelines prohibit this from occurring. Given the small budget for this research, and considering that schools are primarily a setting for learning, alternative strategies were either not feasible or appropriate.

A key concern associated with the low response rate in this study is sample bias. This study may not have captured the students most at risk of depressive symptoms (Blom-Hoffman et al., 2009; Esbensen et al., 2008). The researcher for this study had a duty of care to the participants. Therefore if the survey responses indicated that a participant may have a health issue, a protocol was established to notify the parents and the appropriate school personnel (Langhinrichsen-Rohling et al., 2006; Shochett & O'Gorman, 1995). Consequently, with the knowledge that this may happen, students may have purposely discarded the consent form because they were concerned that they might be 'singled out' from their peers if they indicated at risk responses (Langhinrichsen-Rohling et al., 2006). Alternatively, parents may not have provided active consent because they are already aware their child had a mental health problem and were worried their child's survey responses might be disclosed (Unger et al., 2004). Although parents and students were made aware of the confidential nature of the information to the researcher and the act of releasing information to school personnel was only to be made with the best interest of the child in mind, active consent and the associated low response rate in this study may have been affected by sample bias.

Depressive Symptoms

This study assessed the level of depressive symptoms by categorising scores as above the gender-specific cut off scores (males >22, females >24). It also assessed the severity of depressive symptoms in the sample as minimal (0-15), mild (16-20), moderate (21-30) or severe (>31). Results indicated the proportion of students scoring above the gender-specific cut off scores (males >22, females >24) was 6.4%. This is lower than a prevalence of 10% using the same cut off scores, reported in previous research involving American students (Hallfors, 2004).

Recent Australian research using a cut off score of 24 for all students reported a prevalence of 11% (n=25) (Yap, 2008).

Although the current study reported a low prevalence rate based on cut off scores, it found that approximately 17% of students (n=16) were classified to have moderate (14.9%) or severe (2%) depressive symptoms. This is similar to Australian prevalence figures for young people that suggest 1 in 5 adolescents may be experiencing depression (Rowe et al., 2009). Another Australian study reported lower percentages for moderate depressive symptoms (9.0%) but higher percentages for severe depressive symptoms (7.9%) (Allison et al., 2001).

The lower overall lower prevalence rate of depressive symptoms found in this study compared to previous research may be a result of the low response rate, and may not have captured the students most at risk of depressive symptoms. Additionally, protective factors may have also contributed to a low prevalence rate in this study. The socio economic status (SES) of the school in this research was moderate, and this may have lowered the prevalence rate of students at risk of depressive symptoms. The literatures suggests that mental health problems and self reported depressive symptoms are higher in adolescents from a lower socio economic status, comprised of single parent families, poor living conditions, unemployment, low income and limited education (Sawyer et al., 2007; Tausig et al., 2004; Taylor et al., 2005). Therefore, the moderate SES of the school in this study could have played an important protective role to students.

Furthermore, the school environment may have also contributed. The school in this study had a school nurse and psychologist. It has been documented that the most common place that adolescents seek help is at school, and having access to these support services for help is crucial

in lowering the incidence of depressive symptoms in young people (Sawyer et al., 2007; Slade et al., 2009). Therefore, perhaps as a result of having better access to these services, students in this study did not have a prevalence rate as high as previously reported.

Ryan (2005) acknowledges that the prevalence rate of depression is likely to underestimate adolescents who experience mild or moderate depressive symptoms. In this study, a number of participants did not meet the cut off score by only one or two points. Although the percentage of students scoring above the cut off score was low, some students may be experiencing just one or two symptoms at a very high frequency (most or all of the time). Although these students did not meet the cut off from their overall score, it is these young people that the overall prevalence rate is likely to miss.

Year differences

It was hypothesized that students in the younger year groups would indicate a higher level of depressive symptoms than students in the older year groups. The current study did not find any significant differences between year groups but changes in the mean total score were observed from year 8 to 12. Overall, the mean total score for girls and boys combined appeared to increase from 12 – 14 year olds in year 8 and 9 (11.37) to 14 – 15 year olds in year 10 (15.07) and decrease by age 16-17 year olds in year 11 and 12 (11.27).

This pattern of depressive symptoms is consistent with previous research. Audrain-McGovern (2009) noted an increase in mean total score in American boys and girls from year 9 (13.90) to 10 (14.54), followed by a decline in year 12 (13.00). Similarly, Poulin (2005) found that depressive symptoms were elevated in year 9 and 10, but lower in year 12. In contrast, Cuijpters (2007) noted an overall increase in the mean total scores between 12-14 years (13.40), 15 years (12.70) and 16-17 years (14.90).

All year groups recorded similar numbers of students who scored above the cut off. Findings from previous research does not support this finding indicating that the prevalence rates of depressive symptoms appears to be greatest from early to mid adolescence (year 10), and declines by late adolescence. The largest proportion of adolescents who score above the cut off score tends to be greatest at age 14 (year 9 and 10) (Angold, 2002). When classified according to minimal, mild, moderate or severe categories, the current study found that the greatest number of students that were classified as having moderate and severe depressive symptoms were in year 10 (14 – 15 years). This is comparable with research by Poulin et al., (2005) who reported the most elevated depressive symptoms occurred in students 15 and 16 years of age.

Research does indicate that depressive symptoms increase from late childhood to early adolescence, and peak in mid adolescence (Kort-Butler, 2009; Mazza et al., 2009; Van Voorhees et al., 2008). These changes in the level of depressive symptoms from early to mid adolescence results from a complex and dynamic interaction of various factors from social, economic and cultural environments (Raphael, 2000). Risk factors predispose adolescents to a higher magnitude of stress and anxiety, and if protective factors are not in place, an individual may have an increased vulnerability to experience depressive symptoms (Rowe et al., 2009).

Depressive symptoms in this study were highest in year 10, and therefore, students in this year group may have been exposed to a greater number of risk factors. Risk factors such as low perceived parental and peer support may have become significant or there may have been an increase in negative life events. Bullying could have increased and this tends to increase the prevalence and severity of depressive symptoms. Bullying is harmful to the emotional well being of adolescents, including loneliness, anxiety and depression (Rowe et al., 2009). Also, difficulties interacting with peers as a result of bullying could have increased the severity of

depressive symptoms, because the associated beneficial effects of a strong support network are lacking (Rowe et al., 2009;Tausig et al., 2004).

Students in year 10 in this study may have also experimented with hazardous behaviours, such as unsafe sex, alcohol use, cigarette smoking and cannabis use, which are documented risk factors to depressive symptoms (Chang et al., 2005; Monahan & Lee, 2008; Owens et al., 2008; Poulin et al., 2005). Conversely, higher scores for depressive symptoms in year 10 may be a result of students having less protective factors, such as spirituality, a positive coping style, family cohesion, parental and peer support, and a supportive school environment, and consequently, had less resilience to confront challenges and stressors that increased the risk to depressive symptoms (Rowe et al., 2009).

Gender differences

The present study also hypothesized that girls would show a higher level of depressive symptoms than boys. The results of the present study confirmed this. Findings indicated that based on the total score for all year groups combined, girls (12.50) scored significantly higher than males (8.50). These results support American research using the same tool (CES-D) that showed differences between girls (13.90) and boys (11.00) (Leher, 2005). Similarly, significant differences were observed in Australian research by Allison (2001) for mean CES-D scores between girls (13.90) and boys (11.40). Cujipers (2007) also found significant differences between mean CES-D score between boys (10.70) and girls (15.50).

This study also revealed different patterns of depressive symptoms between girls and boys between year groups. For females, the mean total score remained high from year 8 and 9 (14.50) to year 10 (17.50) and declined by year 11 and 12 (11.00). For boys, the mean total score

greatly increased from year 8 and 9 (7.00) to year 10 (14.40) and declined dramatically in year 11 and 12 (8.00). The current study also found that girls in year 8 and 9 had a significantly higher total score than boys ($p < .01$). Research highlights that the trajectory of depressive symptoms from late childhood appears to be peak in mid adolescence for girls, but decline to normal levels by mid adolescence for boys (Dekker et al., 2007). This pattern of depressive symptoms is supported by Poulin (2005) who found that that in girls, depressive symptoms appeared to increase from year 7 to 9, peak in year 10, and then decrease by year 12.

This study did not find a significant difference between the number of boys and girls who scored above the cut off for depressive symptoms. Yap (2008) also failed to find any significant differences between percentage of Australian girls and boys categorised to be at risk of depressive symptoms using the same cut off scores. Despite this, Australian and international, cross sectional research has consistently reported a greater prevalence rate of depressive symptoms among girls than boys (Hankin et al., 2007; Kort-Butler, 2009; Mazza et al., 2009; Van Voorhees et al., 2008). Australian research has reported a greater percentage of adolescent girls (22%) than boys (16%) scoring above gender specific cut off scores (Sawyer et al., 2009). Similarly, Leher (2005) found that significantly more girls (15.7%) than boys (9%) scored above the cut off score in research with American adolescents. When classified according to minimal, mild, moderate or severe categories, the current study reported that a greater proportion of girls (10.7%) than boys (6.4%) were classified as having moderate or severe depressive symptoms. In Australian research, Allison et al., (2001) reported higher percentages for both girls (21.4%) and boys (13.2%) for moderate and severe depressive symptoms combined.

The higher level and greater severity of depressive symptoms in girls in this study may be attributed to factors associated with their physical, social and emotional development. Girls go

through puberty earlier than boys and appear to experience a more difficult adolescent transition than boys (Rowe et al., 2009; Stemmler & Petersen, 2005). Girls also experience feelings and emotions differently to boys, and tend to have an anxious temperament, particularly towards lower perceived parental and peer support, and this may have contributed to higher levels of depressive symptoms in students in this study (Field et al., 2001; Rowe et al., 2009). Maternal depression places girls at a greater risk of depressive symptoms than boys, which is probably due to the lack of attachment between teenage girls and their mothers (Chen et al., 2009).

Perhaps girls in this study experienced a series of negative events or more daily stressors than boys, and the compounding effect may have left them feeling less optimistic and hopeful about the future, as outlined in Sawyer et al., (2009). Alternatively, they could have reacted to these stressors negatively. Although a negative coping style is associated with depressive symptoms in both genders, it is significantly stronger in girls and this may explain the gender differences in this study (Bouma et al., 2008; Hankin, 2009; Meadows et al., 2006). Girls tend to use less problem focused strategies to overcome challenges and are less likely to seek support, which places them at a higher point of stress and greater risk of depressive symptoms (Li et al., 2006; Shahar et al., 2006).

Therefore, the significant difference in depressive symptoms between girls and boys in year 8 and 9 may be attributed to girls feeling anxious about developing friendships or belonging to a peer group (Stemmler & Petersen, 2005). Although parental support may be high during this time and protect them against depressive symptoms, perceived lower peer support such as less optimal peer relationships, fewer friends or reduced popularity, may have acted as a more significant risk factor to depressive symptoms in this year group. Conversely, there is limited research to explain a significant increase in depressive symptoms in boys from year 8 to 10. This

may be a result of aforementioned factors such as bullying or experimentation with hazardous behaviours. Perhaps the transition between years 9 to 10 is the most difficult for boys, possibly related to puberty and the associated physical and emotional changes occurring during this time. This is clearly an area of future research that warrants further investigation.

Extra Food Intake

The present study found that the mean total intake for extra food was 8.08 servings per day. Recent research has found that 89% of Australian adolescents consumed extra foods on a daily basis (Savidge et al., 2007). The Australian Guide to Healthy Eating suggests extra food is to be consumed occasionally and in small amounts, as they are nutritionally poor and energy dense, and not essential for good health (Smith et al., 1998). The results of this study are consistent with previous literature that suggest the consumption of extra foods appears to be two to four times above the recommended limit of 1-3 servings per day (Rangan et al., 2008).

Year differences

It was hypothesized that older students would consume more extra food than younger students overall. Although not significant, the number of total servings of extra food was found to decrease from year 8 and 9 to year 10, followed by an increase in year 11 and 12. Overall, take away food and snack food declined, and drinks appeared to increase from year 8 and 9 to year 10, and decline by year 12. Party food remained relatively unchanged through the years. Recent Western Australian research has observed an increase in the consumption of take away, drinks and confectionary and a slight decline in the consumption of snack food and cereal bars from primary to secondary school (Martin et al., 2009). In secondary school, a significant increase has been observed in energy drinks in students from 12-13 to 14-15 years (Scully et al., 2007). In addition, mean daily consumption of snack foods and cereal based products also appears to

increase from early to mid adolescence (Commonwealth Scientific Industrial Research Organisation, 2008).

The greater consumption of extra food by older students in year 11 and 12, compared to year 8 and 9 in this study, may be attributed to the influence of parents and peers. During early adolescence, parents are particularly influential to adolescent food intake. If adolescents perceive their parents to be eating healthier foods, they are more likely to eat healthier food themselves (Martens et al., 2005). Mothers appear to be the most significant individual for prompting dietary change and limiting fast food intake (Backman et al., 2002; Bauer et al., 2008). However, from mid to late adolescence, the contribution of parent modeling to adolescent food intake declines and peers become more influential. Peers tend to deter adolescents from consuming healthier foods, as it is more socially acceptable for adolescents to eat less healthy options (Croll et al., 2001; Giskes et al., 2005; Hsieh, 2004).

Older adolescents have greater autonomy and independence to make their own decisions about what they eat or drink, and this may have contributed to greater intake by older students in this study. When extra food is more accessible and available to them, the choice to consume extra food is more appealing (Martens et al., 2005). Furthermore, if adolescents enjoy the taste of extra food, preference for this food is likely to be higher and consequently, consumption tends to increase (Bauer et al., 2008). Healthy food is perceived to be less available, expensive, requires more time and energy to prepare, and is less tasty than unhealthy food (Croll et al., 2001; Giskes et al., 2005; O'Dea, 2003). Conversely, extra food which is available and accessible away from home is perceived to be more convenient to purchase, and taste better (Martens et al., 2005). Therefore, perhaps the greater intake in the older year group in this study is due to adolescents

making their own decisions about what they eat or drink, and the ease to which extra food can be accessed and purchased.

Gender differences

It was hypothesized that overall, boys would consume more servings of extra food than girls. Results did not support this prediction as no significant gender differences were observed. Previous research has indicated that boys tend to consume more extra food than girls (Booth et al., 2004; Martin et al., 2009; Savige et al., 2007; Scully et al., 2007). Australian studies have documented that more secondary school boys consume snack foods (Martin et al., 2009), soft drinks and energy drinks than girls (Abbott et al., 2007; Booth et al., 2004; Scully et al., 2007) but less confectionary and cereal bars (Martin et al., 2009).

As previous research has consistently reported that boys do consume more extra food than girls, the lack of significance in extra food intake between boys and girls in this study could have been a result of a small sample size. The low response rate may have also missed students at risk of high extra food intake. Also, the students in the study attended a school of a moderate socio-economic status (SES). It has been documented that adolescents with a low SES tend to eat more fast food frequently, and conversely, adolescents from a higher SES tend to consume more fruit and vegetables, and less high fat foods (Bauer et al., 2008; Boutelle et al., 2003). Therefore, the moderate SES for students in this study may have played a protective role against any significant gender differences in extra food intake between boys and girls.

The current study found that younger girls consume significantly more take away, party food and snack food than boys. The greater intake of party food and snack food in girls in the younger year groups is consistent with previous research. Booth et al (2004) observed gender

differences with age, reporting that boys' consumption of confectionary reduces from 14% to 8.5% in years 8 to 10, but increases from 10.7% to 13.6% for girls. In addition, Scully et al. (2007) reported more girls consume snack food at 12-13 years and 14-15 years than boys, but less than boys at age 16-17 years (Scully et al., 2007). This study also reported that older boys consumed significantly more take away food than older girls. This supports current Western Australia research which showed significantly more secondary school boys (33.7%) than girls (18.4%) consume take away food. Other Australian studies also reported boys consume a greater amount of fast food than girls, and at a higher frequency (Abbott et al., 2007; Scully et al., 2007).

The greater consumption of take away, party food and snacks by girls in the younger year groups may be a result of accessibility and availability to extra food or taste preference as previously mentioned, or a consequence of peer influences. Younger girls may feel it is often embarrassing or 'uncool' to eat healthier foods if their friends are eating unhealthy food (Croll et al., 2001; Giskes et al., 2005). The contribution of peer expectations to eat unhealthy foods may lead girls to consume more extra food during the younger year groups, particularly because they are striving to develop friends and belong to peer groups during this time (Hsieh, 2004). Boys in year 8 and 9 in this study may not have been as susceptible and vulnerable to these peer expectations, and consequently, their extra food intake was lower. Younger boys may have been influenced by parental modeling of healthy eating behaviours which could have been protective against fast food intake and the consumption of high fat snacks (Backman et al., 2002; Bauer et al., 2008; Martens et al., 2005).

The higher intake of take away in older boys in this study may be a consequence of a decline in the contribution of parental modeling of healthy food behaviours, and an increase in peer influences. Compared to girls who seek peer acceptance in year 8 and 9, boys may strive for

this in the older year groups, and consequently the expectations to belong or be accepted by a group of peers may include the consumption of extra food (Croll et al., 2001; Giskes et al., 2005; Hsieh, 2004). Boys in this study may have also been more susceptible to the advertising of fast food, as it has been documented that fast food is the most heavily advertised unhealthy food on television and consequently, is consumed more frequently (Chapman et al., 2006). Conversely, the lower intake of extra food in the older year groups in girls, may have also been influenced by hazardous eating behaviours, which could involve the restriction of food overall, and consequently a lower intake of take away (Fulkerson et al., 2004; Tomori & Rus-Makovec, 2000).

Timing of Intake

It was hypothesized that total extra food intake would be higher on the weekend compared to the weekdays. Findings of the present study support this hypothesis but the difference between weekday and weekend intake was not significant. Previous research has consistently reported variations in dietary intake between weekdays and the weekend (Cullen et al., 2002; Jackson et al., 2008; Matheson et al., 2004). Post, Kemper and Essen (1987) found that adolescents aged 12-17 years had a greater intake of energy, sugar and fat on the weekend compared to school days. Other research has also found a greater consumption of nutritionally poor snacks and less balanced meals on the weekend compared to the weekdays in children (Sepp et al., 2006). In regards to snacks specifically, the current research reported snack food consumption on the weekday to be significantly higher than snack food consumption on the weekend.

When weekend intake was observed independent from weekday intake, differences were observed in years 8 and 9 and years 11 and 12. In year 8 and 9, girls consumed significantly

more party food than boys, and significantly more snack food than boys. Findings of the current study also indicated that year 11 and 12 boys consumed significantly more servings of takeaway than girls. Previous research regarding gender differences found girls had a greater fat intake on school days and boys consumed more the weekend (Post et al., 1987).

The greater intake on the weekend compared to weekdays among students of this study may be a result of the unstructured activities that take place on the weekend compared to the weekday. Saturday and Sunday are an opportunity for students to socialise with friends, and this socialisation tends to be centered around fast food outlets, where the type of food consumed is nutritionally poor. In addition, this target group appears to participate in organised sport on the weekend, and may be accessing extra food items at canteens which are common at many recreational facilities. On weekdays, students are at school and structured meal times are placed throughout the day for recess and lunch, which more or less, limits the opportunities for students to eat and drink constantly. Although an audit of the canteen of the school in this research was not conducted, the unstructured nature of the weekend promotes opportunities for greater access to extra food and could have been a significant contributor to greater intake on the weekend in this study.

Television viewing may have also influenced a greater consumption of extra food on the weekend. Matheson et al., (2004) found that the percentage of daily energy intake consumed during television viewing appears to be higher on the weekends (25%) compared to weekday (20%) (Matheson et al., 2004). In a review of current advertising on free-to-air television in Australia, Saturday morning was found to have the greatest concentration of unhealthy/non-core foods than any other day (Chapman et al., 2006). In particular, Saturday morning had more than six advertisements of these foods being shown per hour, and may influence adolescents to

consume more extra food during this time on the weekend. However, evening hours between 6 p.m. and 9 p.m. also have a high frequency of unhealthy/non-core food advertisements, and may increase extra food consumption on the weekdays. Take away, confectionary and chocolate are the most heavily advertised foods, and are often consumed in greater quantities whilst watching television (Chapman et al., 2006).

Extra Food Intake and Depressive symptoms

Although hypothesized, the present study did not find a relationship between total extra food intake and depressive symptoms. Previous cross sectional research has associated a diet high in processed and unhealthy foods with depressive symptoms (Jacka, Kremer et al., 2010; Oddy et al., 2009). It appears the more extra food you consume in your diet, the greater the likelihood of depressive symptoms (Akbaraly et al., 2009). The current research was unable to detect a significant relationship between the specific intake of extra food and depressive symptoms, however, this is likely to be attributed to a small sample size and consequently, limited statistical power to detect significance. Also, since the study did not record total food, other health foods may be contradicting the impact of extra food.

In relation to the role of the type of extra food to depressive symptoms, a key finding of the current study was that drinks approached significance. Drinks investigated in the current study included soft drink, diet soft drink, milkshake, energy drink and cordial. Previous research regarding the role of drinks to physical or mental health has mainly focused on soft drink and cordial. Longitudinal research has found that the physical health of an adolescent is likely to be poorer when cordial or soft drink has been consumed frequently earlier in life (Tam et al., 2006). In particular, soft drink and cordial consumption appears to be associated with weight gain over time and has been linked with childhood and adolescent obesity (Gill, Rangan, & Webb, 2006;

Tam et al., 2006). In regard to mental health, soft drink appears to be detrimental to conduct problems and causes mental distress in adolescents (Lien et al., 2006). Soft drink consumption has been associated with depression, stress, suicidal ideation and psychological distress in Australian adults (Zumin et al., 2010).

Drinks became statistically significantly related to depressive symptoms, only when year was factored into the linear mixed model for analysis. Findings revealed that the consumption of drinks in year 10 was significantly related to depressive symptoms, specifically cordial, diet soft drink and milkshakes. Soft drink consumption in year 9 also significantly increased the risk of depressive symptoms. Generally, students in these year groups drink soft drink more frequently and in greater amounts than students in other year groups (Abbott et al., 2007; Booth et al., 2004). Interestingly, the current study did not observe any association between energy drinks and depressive symptoms. This is a concern, given that emerging evidence suggests the ingredients in energy drinks may be linked to mood and behaviour problems (Finnegan, 2003; Walker et al., 2010). Currently, there appears to be limited research about the possible association between energy drinks and depressive symptoms. This is clearly an area that requires further investigation.

Take away, party food and snack food in the current study also became significant to depressive symptoms, but only when they interacted with one or more specific year group. Findings revealed that take away consumption in year 8 and 9 and year 11 and 12, snack food consumption in year 8 and 10, and party food consumption in year 11 and 12 were significant to depressive symptoms. Perhaps the high sugar, fat and salt content of these food and drinks has contributed to a higher incidence of depressive symptoms in this study (Smith et al., 1998). This may be due to lack of nutrients in extra food, such as omega 3 and folate which have a positive

effect on mood, stress and tension (Dunne, 2010). Furthermore, the consumption of specific types of foods in certain years illustrates that a complex interaction of factors, such as SES, taste, food availability and accessibility, parental and peer influences, television and advertising influence extra food intake (Bauer et al., 2008; Chapman et al., 2006; Coon et al., 2001; Croll et al., 2001; Giskes et al., 2005; Lytle et al., 2003; Martens et al., 2005; Matheson et al., 2004; O'Dea, 2003).

Given previous research has found a relationship between energy dense, nutritionally poor food and mental health problems in children and adolescents, it is important that risk factors are minimized and protective factors strengthened (Jacka, Kremer et al., 2010; Lien et al., 2006; Oddy et al., 2009; Wiles et al., 2009). Without controlling for any of these factors in this study, it is difficult to determine which factors are the most significant contributors to extra food intake. For instance, high extra food may have been proportionate to the amount of food consumed overall. This research has identified a relationship between girls, especially in year 10, who consume extra food on weekend and depressive symptoms. This finding alone warrants further investigation into the impact of extra food on mental health.

Chapter Six: Conclusion

This study did not find a significant relationship between total extra food intake and depressive symptoms; however it did reveal some other important findings. The overall prevalence of depressive symptoms detected in this study approached one in five students and given those most at risk may not have participated, this suggests that the actual prevalence may be greater. For this school, it means that in an average sized class of 30 students, at least six young people may be experiencing at least moderate depressive symptoms. Overall girls appeared to be most at risk, with those in year 10 at a greater risk. For boys the significant increase in depressive symptoms between year 8 and 9 and year 10 indicates that year 10 is a critical year and warrants further research.

The year and gender differences in this study highlight the importance of early diagnosis and treatment but also preventive measures such as providing opportunity for young people and girls in particular, to develop protective factors such as positive coping style and optimal relationships with peers, family members and teachers, to build resilience and overcome negative life events and daily stressors. The findings of this study suggest that year 10 emerges as a critical year for both boys and girls with depressive symptoms peaking at this time. Risk factors such as alcohol and other drug use, sexual behavior, bullying and social isolation, clearly must be addressed prior to and again during year 10 in an effort to provide more protection against the development of depressive symptoms.

The intake of extra food appeared to decrease from year 8 to year 10, but increased in year 12. The contribution of peers and an increased accessibility to extra food, combined with more independence and autonomy to make decisions about food, may exert greater influence on extra food intake as adolescents grow older. Of all the types of extra food investigated, drinks

were found to be related to depressive symptoms. Specifically, year 10 girls who consumed cordial were reported to be at greater risk of depressive symptoms. However, soft drink in year 9, and diet soft drink and milkshakes in year 10 were also related to depressive symptoms. Consumption of extra food was higher on weekends compared to weekdays. More take away food and drinks was consumed on the weekend compared to the weekday, and this was also significantly related to depressive symptoms.

The high intake of extra food in this study is concerning. It appears that current messages relating to healthy eating may not be resonating with the young people in this study. The many influences on extra food appear to be outweighing the messages regarding the benefits of healthy food choices. Perhaps targeted messages about weekend intake to encourage young people to make healthy food choices should be investigated. Furthermore, as certain year groups and types of food interacted differently, these messages may need to be tailored to specific year groups to be most effective.

If nutritionally healthy food can protect against mental health problems, then the reverse may also be true; nutritionally poor extra food might be a risk factor for mental health problems. This appears to be the case for the year 10 girls in this study. Other relationships found in this study between different types of extra food and different year groups, indicates that education around healthy eating should occur before year 10 with specific messages targeted to specific years. These messages should emphasize the importance of a high quality diet, eating breakfast and regular family meals as protective factors for depressive symptoms.

Adolescence is a critical developmental period for physical, social and emotional change, and it is during this time that young people start to make decisions about health enhancing and

health compromising behaviours. One of these behaviours is food intake. Some types of extra foods appear to increase the risk of adolescents experiencing depressive symptoms.

Understanding the contribution of risk factors, such as extra food and the role of protective factors is important to the prevention of mental health problems in young people. It is critical that during early adolescence, important protective factors are fostered to counter the increase in risk factors as young people grow older. Adolescents should be encouraged to develop stable relationships with peers and parents, adopt positive coping strategies and establish positive thinking patterns to support healthy emotional and social well being. This may enhance resilience in young people increasing their ability to confront everyday stressors, rebound positively from adversity and become even stronger to face future challenges.

Implications

For future research

Given the results of this study, a number of recommendations for future research and practice are suggested.

Approximately 17% of students in this study were classified with moderate or severe depressive symptoms. Future research should investigate participants classified with moderate or severe depression or depressive symptoms to determine how much extra food they are eating, what types of extra food they are consuming and proportion of extra food in the total diet, and if this impacts on depressive symptoms. It may be the case that these students have high depressive symptoms, but are eating a low amount of extra food. This may be the influence of restrictive eating behaviours, which have been known to be associated with depression, particularly in adolescent girls (Fulkerson et al., 2004; Tomori & Rus-Makovec, 2000). The interaction of

breakfast eating (recorded but not reported in this study) and extra food intake and gender on depressive symptoms should also be examined.

In this study drinks had a significant association with depressive symptoms. Most of the drinks investigated contain caffeine (soft drink, diet soft drink and energy drinks). Walker et al., (2010) has identified that that these types of drinks appear to be linked with mood or behavioural problems. These drinks are appealing to high school students because they have a short term feeling of increased energy, alertness, and motivation (Finnegan, 2003). The concern is that when consumption of these drinks is high, the negative effects become more severe, and the associated withdrawal effect may lead to an increase in depressive symptoms (Lubbe & Bell, 2009). As consumption of energy drinks does increase in secondary school students, particularly boys, future research is required to investigate the exact role of 'stimulant' or 'energy' drinks on short or long term health in adolescent populations.

Although only 6.4% of participants in this study scored above the gender specific cut off scores, these students reported very high scores (25-37). Furthermore, a number of participants that did not meet the cut off score indicated they experienced some of the depressive symptoms listed on the survey at a higher frequency than others. Future research should investigate the most commonly reported depressive symptoms, and determine which symptoms increase the risk of meeting the cut off score. Differences between girls and boys, and variations between year groups should also be explored. This would provide insightful information about where further investigation is required and determine the point at which initiatives and programs would be most effective.

This study found that depressive symptoms in boys increased significantly between years 8 and 9, and year 10. This was a surprising finding and warrants further investigation. Year 10 emerged as the year where depressive symptoms peaked for both genders. More research regarding the influence of risk and protective factor on mental health for this age group (14-15 year olds) is required

For practice

The current study found that depressive symptoms are greatest from early (13 to 14 years) to mid adolescence (15 years) and are most severe in year 10. This highlights the need to deliver education about depressive symptoms during the earlier years of high school, in the hope that students will be better equipped to confront challenges and daily stressors in mid to late adolescence. This education may include the identification of symptoms, the associated risk factors and ways to build resilience and foster protective factors in young people.

This study indicated that although only a minority of students scored above the cut off for depressive symptoms, approximately 17% of students were classified as having symptoms at a moderate or severe level. This indicates that approximately one in five students experience depressive symptoms daily and highlights the need to have the appropriate support mechanisms in place for students to seek help, including student services and school counselors. This will assist in fostering a positive school environment and healthy adolescent development.

Intake of extra food was greatest from year 10 to 12, and the consumption was greater on the weekend, particularly take away food and drinks. At age 15, adolescents have a greater level of autonomy to make their own choices about food. Therefore, initiatives targeting unhealthy eating need to focus on the various influences over food choices on the weekend and occur at a

time when autonomy increases and parental influence declines. In particular, initiatives that reduce the sale of extra food items at sport and recreation facilities and limit fast food advertising are important in assisting adolescents to eat healthier food outside of school hours.

Schools are ideal places for research about young people to occur. However, given the low response rate in this study; researchers, schools and ethics committees need to work together to explore how to best maintain ethical considerations around sensitive issues but maximize participation. If this is not addressed then those most at risk of health compromising behaviours may exclude themselves from the research. This may potentially bias the findings resulting in underestimating the true prevalence or severity of issues related to young people.

Reference List

- Abbott, R. A., Macdonald, D., Stubbs, C. O., Lee, A. J., Harper, C., & Davies, P. S. (2007). *Healthy Kids Queensland Survey 2006*. Queensland Health: Brisbane.
- Abrantes, A. M., Strong, D. R., Ramsey, S. E., Lewinsohn, P. M., & Brown, R. A. (2006). Characteristics of dieting and non dieting adolescents in a psychiatric inpatient setting. *Journal of Child and Family Studies*, 15(4), 419-433.
- Ajzen, I. (1991). The theory of planned behaviour. *Organisational Behaviour and Human Decision Processes*, 50, 179-211.
- Akbaraly, T. N., Brunner, E. J., Ferrie, J. E., Marmot, M. G., Kivimaki, M., & Singh-Manoux, A. (2009). Dietary pattern and depressive symptoms in middle age. *The British Journal of Psychiatry*, 195, 408-413.
- Allison, S., Roeger, L., Martin, G., & Keeves, J. (2001). Gender differences in the relationship between depression and suicidal ideation in young adolescents. *Australian and New Zealand Journal of Psychiatry* 35, 498-503.
- Ambrosini, G. L., Mackerras, D., de Klerk, N. H., & Musk, A. W. (2002). Comparison of an Australian food-frequency questionnaire with diet records: Implications for nutrition surveillance. *Public Health Nutrition*, 6(4), 415-422.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th edition). Washington: American Psychiatric Press.
- Au, A. C. Y., Lau, S., & Lee, T. Y. (2009). Suicide ideation and depression: The moderation effects of family cohesion and social self concept. *Adolescence*, 44(176), 851-868.
- Audrain-McGovern, J., Rodriguez, D., Patel, V., Faith, M. S., Rodgers, K., & Cuevas, J. (2006). How do psychological factors influence adolescent smoking progression? The evidence for indirect effects through tobacco advertising receptivity. *Pediatrics*, 117(4), 1216-1225.
- Australian Bureau of Statistics. (2009). *Causes of Death 2007*. Retrieved October 10, 2009, from www.abs.gov.au.

Australian Institute of Health and Welfare. (2007). *Young Australians: Their health and wellbeing 2007*.

Commonwealth of Australia: Canberra.

Australian Institute of Health and Welfare. (2010). *Australia's health 2010*. Commonwealth of Australia:

Canberra.

Backman, D. R., Haddad, E. A., Lee, J. W., Johnston, P. K., & Hodgkin, G. E. (2002). Psychosocial predictors of healthful dietary behavior in adolescents. *Journal of Nutrition Education and Behavior* 34, 184-193.

Baines, S., Powers, J., & Brown, W. J. (2006). How does the health and well being of young Australian vegetarian and semi-vegetarian women compare with non-vegetarians? *Public Health Nutrition*, 10(5), 436-442.

Bamber, D. J., Stoke, C. S., & Stephen, A. M. (2007). The role of diet in the prevention and management of adolescent depression. *British Nutrition Foundation Nutrition Bulletin*, 32(1), 90-99.

Bandura, A. (1986). *A social foundation of thought and action: A social cognitive theory*. New Jersey: Prentice-Hall.

Baranowski, T., Cullen, K. W., & Baranowski, J. (1999). Psychological correlates of dietary intake: Advancing dietary intervention. *Journal of American Dietetic Association*, 19, 17-40.

Bauer, K. W., Larson, N. I., Nelson, M. C., Story, M., & Neumark-Sztainer, D. (2008). Socio-environmental, personal and behavioural predictors of fast-food intake among adolescents. *Public Health Nutrition*, 12(10), 1767-1174.

Beck, A. T., Rush, A. J., Shaw, B., & Emery, G. (Eds.). (1979). *Cognitive theory of depression*. New York: Guilford Press.

Bessant, J. (2006). The fixed age rule: Young people, consent and research ethics. *Youth Studies Australia* 25(4), 50-57.

Bingham, S. A., Gill, C., Welch, A., Day, K., Cassidy, A., Khaw, K. T., et al. (1994). Comparison of dietary assessment methods in nutritional epidemiology: Weighed records v. 24 h recalls, food-frequency questionnaires and estimated-diet records. *British Journal of Nutrition*, 72, 619-643.

- Biro, G., Hulshof, K. F., Ovesen, L., & Amorim Cruz, J. A. (2002). Selection of methodology to assess food intake. *European Journal of Clinical Nutrition*, 56(S2), S25-S32.
- Blom-Hoffman, J., Leff, S. S., Franko, D. L., Weinstein, E., Beakley, K., & Power, T. J. (2009). Consent procedures and participant rates in school based intervention and prevention research: Using a multi component, partnership-based approach to recruit strategies. *School Mental Health*, 1, 3-15.
- Booth, M., Okley, A. D., Denney-Wilson, E., Hardy, L., Yang, B., & Dobbins, T. (2004). *NSW Schools Physical Activity and Nutrition Survey 2004*. NSW Department of Health.
- Bouma, E., Ormel, J., Verhulst, F., & Oldehinkel, A. (2008). Stressful life events and depressive problems in early adolescent boys and girls: The influence of parental depression, temperament and family environment. *Journal of Affective Disorders*, 105(1), 185-193.
- Boutelle, K. N., Birnbaum, A. S., Lytle, L. A., Murray, D. M., & Story, M. (2003). Associations between perceived family meal environment and parent intake of fruit, vegetables and fat. *Journal of Nutrition Education Behavior*, 35(1), 24-29.
- Brooks, T. L., Harris, S., Thrall, J. S., & Woods, E. R. (2002). Association of adolescent risk behaviors with mental health symptoms in high school students. *Journal of Adolescent Health*, 31, 240-246.
- Brunner, E., Stallonw, D., Juneja, M., Bingham, S., & Marmot, M. (2001). Dietary assessment in Whitehall II: Comparison of 7d diet diary and food-frequency questionnaire and validity against biomarkers. *British Journal of Nutrition*, 86, 405-414.
- Buzi, R. S., Weinman, M. L., & Smith, P. B. (2007). The relationship between adolescent depression and a history of sexual abuse. *Adolescence*, 42(168), 679-688.
- Buzzard, I. M., Stanton, C. A., Figueiredo, M., Fries, E. A., Nicholson, R., Hogan, C. J., et al. (2001). Development and reproducibility of a brief food frequency questionnaire for assessing the fat, fiber, and fruit and vegetable intakes of rural adolescents. *Journal of American Dietetic Association*, 101, 1438-1446.

- Caputsi, A., D'Alessandro, C., Castrogiovanni, S., Barale, A., & Morelli, E. (2002). Nutrition knowledge and dietary composition in Italian adolescent female athletes and non-athletes. *International Journal of Sport Nutrition and Exercise Metabolism* 12, 207-219.
- Chang, G., Sherritt, L., & Knight, J. R. (2005). Adolescent cigarette smoking and mental health symptoms. *Journal of Adolescent Health*, 36, 517-522.
- Chapman, K., Nicholas, P., & Supramaniam, R. (2006). How much food advertising is there on Australian television. *Health Promotion International*, 21(3), 172-180.
- Charoensuk, S. (2007). Negative thinking: A key factor in depressive symptoms in Thai adolescents. *Issues in Mental Health Nursing*, 28, 55-74.
- Chen, M., Johnston, C., Sheeber, L., & Leve, C. (2009). Parent and adolescent depressive symptoms: The role of parental attributions. *Journal of Abnormal Psychology*, 37, 119-130.
- Clarke, G. N., Hawkins, W., Murphy, M., Sheeber, L. B., Lewinson, P. M., & Seeley, J. R. (1995). Targeted prevention of uni-polar depressive disorder in an at-risk sample of high school adolescents: A randomised trial of a group cognitive intervention. *Journal of the American Academy of Child Adolescent Psychiatry*, 34, 312-321.
- Commonwealth Scientific Industrial Research Organisation. (2008). *2007 Australian National Children's Nutrition and Physical Activity Survey: Main Findings*: Department of Health and Ageing and Department of Agriculture, Fisheries and Forestry.
- Comrie, F., Masson, L., F., & McNeill, G. (2009). A novel online food recall checklist for use in an undergraduate student population: A comparison with diet diaries. *Nutrition Journal*, 8(13), 1-12.
- Coon, K. A., Goldberg, J., Rogers, B. L., & Tucker, K. L. (2001). Relationships between use of television during meals and children's food consumption patterns. *Pediatrics*, 107(1), 1-9.
- Coppen, A., & Bailey, J. (2000). Enhancement of the antidepressant action of fluoxetine by folic acid: A randomised, placebo controlled trial. *Journal of Affective Disorders*, 60, 121-130.
- Cotton, S., Zebracki, K., Rosenthal, S. L., Tsevat, J., & Drotar, D. (2006). Religion/spirituality and adolescent health outcomes: A review. *Journal of Adolescent Health* 38, 472-480.

- Courser, M. W., Shamblen, S. R., Lavrakas, P. J., Collins, D., & Ditterline, P. (2009). The impact of active consent procedures on non response and non response error in youth survey data: Evidence from a new experience. *Evaluation Review*, 33(4), 370-395.
- Croll, J. K., Neumark-Sztainer, D., & Story, M. (2001). Health eating: What does it mean to adolescents? *Journal of Nutrition Education*, 33(4), 193-198.
- Cuijpers, P., Boluijt, P., & van Straten, A. (2008). Screening of depression in adolescents through the Internet. *European Journal of Child and Adolescent Psychiatry* 17, 32-38.
- Cullen, K. W., Lara, K. M., & De- Moor, C. (2002). Children's dietary fat intake and fat practices vary by meal and day. *Journal of the American Dietetic Association*, 102, 1773-1778.
- Cullen, K. W., Watson, K., & Zakeri, I. (2008). Relative reliability and validity of the block Kids questionnaire among Youth Aged 10 to 17 Years. *Journal of the American Dietetic Association*, 108, 862-866.
- Dekker, M. C., Ferdinand, R. F., Van Lang, N. D. J., Bongers, I. L., Van Der Ende, J., & Verhulst, F. C. (2007). Developmental trajectories of depressive symptoms from early childhood to late adolescence: Gender differences and adult outcome. *Journal of Child and Adolescent Psychiatry* 48(7), 657-666.
- DiNapoli, P. P. (2002). Adolescent violent behavior and ego development. *Journal of Adolescent Health*, 31(6), 446-448.
- Donovan, J., & Jessor, R. (1985). Structure of problem behaviour in adolescence and young adulthood. *Journal of Consulting and Clinical Psychology*, 53(890-904).
- Dowdy, E., Ritchey, K., & Kamphaus, R. W. (2010). School-based screening: A population-based approach to inform and monitor children's mental health needs. *School Mental Health*, 2, 166-176.
- Dunne, A. (2010). Effect of food on emotional wellbeing and mental health. *Nursing & Residential Care*, 12(4), 165-168.

- Dwyer, S. B., Nicholson, J. M., & Battistutta, D. (2003). Population level assessment of the family risk factors related to the onset or persistence of children's mental health problems. *Journal of Child Psychology and Psychiatry*, 44(5), 699-711.
- Eaton, D. K., Lowry, R., Brener, N. D., Grunbaum, J. A., & Kann, L. (2004). Passive versus active parental permission in school-based survey research. *Evaluation Review*, 28, 564-577.
- Eck, L. H., Klesges, R. C., Hanson, C. L., Slawson, D., Portis, L., & Lavasque, M. E. (1991). Measuring short term dietary intake: Development and testing of a 1-week food frequency questionnaire. *Journal of the American Dietetic Association*, 91, 940-945.
- Eckersley, R. (2007). The health and wellbeing of young Australians: Present patterns and future challenges. *International Journal of Adolescent Medicine and Health*, 19(3), 217-227.
- Eisenberg, M. E., Neumark-Sztainer, D., Fulkerson, J. A., & Story, M. (2008). Family meals and substance use: Is there a long term protective association? *Journal of Adolescent Health*, 43, 151-156.
- Eisenberg, M. E., Olson, R. E., Neumark-Sztainer, D., Story, M., & Bearinger, L. H. (2004). Correlations between family meals and psychosocial well being among adolescents. *Archives of Pediatric Adolescent Medicine*, 158, 792-796.
- Elder, J. P., Shuler, L. V., Moe, S. G., Grieser, M., Pratt, C., Cameron, S., et al. (2008). Recruiting a diverse group of middle school girls into the trial of activity for adolescent girls. *Journal of School Health*, 78, 523-531.
- Esbensen, F. A., Melde, C., Taylor, T. J., & Peterson, D. (2008). Active parental consent in school-based research: How much is enough and how do we get it? *Evaluation Review*, 32, 335-362.
- Esbensen, F. A., Miller, M. H., Taylor, T., Freng, N. H., & Freng, A. (1999). Differential attrition rates and active parental consent. *Evaluation Review*, 23(316).
- Farrington, F., McBride, N., & Midford, R. (2000). Conducting research in schools: Lessons learnt from experience. *Health Promotion Journal of Australia*, 10(1), 63-68.

- Field, A. (2009). *Discovering statistics using SPSS* (3rd ed.). London: SAGE Publications Ltd.
- Field, T., Diego, M., & Sanders, C. (2001). Adolescent depression and risk factors. *Adolescence*, 36(143), 491-498.
- Finnegan, D. (2003). The health effects of stimulant drinks. *British Nutrition Foundation*, 28, 147-155.
- Fisher, C. B., Higgins-D'Alessandro, A., Rau, J. M., Kuther, T. L., & Belanger, S. (1996). Referring and reporting research participants at risk: Views from urban adolescents. *Child Development*, 67, 2086-2100.
- French, S. A., Story, M., Neumark-Sztainer, D., Fulkerson, J. A., & Hannan, P. (2001). Fast food restaurant use among adolescents: Associations with nutrient intake, food choices and behavioral and psychosocial variables. *International Journal of Obesity*, 25, 1823-1833.
- Fulkerson, J. A., Sherwood, N. E., Perry, C. L., Neumark-Sztainer, D., & Story, M. (2004). Depressive symptoms and adolescent eating and health behaviors: A multi-facet view in a population-based sample. *Preventive Medicine*, 38(865-875).
- Fulkerson, J. A., Story, M., Mellin, A., Leffert, N., Neumark-Sztainer, D., & French, S. A. (2006). Family dinner meal frequency and adolescent development: Relationships with developmental assets and high risk behaviors. *Journal of Adolescent Health*, 39, 337-345.
- Gill, T. P., Rangan, A. M., & Webb, K. L. (2006). The weight of evidence suggests that soft drinks are a major issue in childhood and adolescent obesity. *Medical Journal of Australia*, 184(6), 263-264.
- Giskes, K., Patterson, C., Turrell, G., & Newman, B. (2005). Health and nutrition beliefs and perceptions of Brisbane adolescents. *Nutrition and Diet*, 62, 69-75.
- Granner, M. L., Sargent, R. G., Calderon, K. S., Hussey, J. R., Evans, A. E., & Watkins, K. W. (2004). Factors of fruit and vegetable intake by race, gender and age among young adolescents. *Journal of Nutrition Education Behavior*, 36, 173-180.
- Greening, L., & Stoppelbein, L. (2002). Religiosity, attribution style, and social support as psychosocial buffers for African American and White adolescents' perceived risk for suicide. *Suicide and Life-Threatening Behavior*, 32(4), 404-417.

- Griffiths, P., Kalic, R., & Gunnell, A. (2009). *Australian School Student Survey 2008: Western Australian Tobacco Results*. Drug and Alcohol Office: Perth.
- Hair, E. C., Park, M. J., Thomson, J. L., & Moore, K. A. (2009). Risky behaviors in late adolescence: Co-occurrence, predictors and consequences. *Journal of Adolescent Health, 45*, 253-261.
- Hakkarainen, R., Partonen, T., Haukka, J., Virtamo, J., Albanes, D., & Lönnqvist, J. (2004). Food and nutrient intake in relation to mental wellbeing. *Nutrition Journal, 3*(14).
- Hallfors, D. D., Waller, M. W., Ford, C. A., Halpern, C. T., Brodish, P. H., & Iritani, B. J. (2004). Adolescent depression and suicide risk. *American Journal of Preventative Medicine 27*(3), 224-231.
- Hankin, B. L. (2009). Development of sex differences in depressive and co-occurring anxious symptoms during adolescence: Descriptive trajectories and potential explanations in a multi-wave prospective study. *Journal of Clinical Child and Adolescent Psychology, 38*(4), 460-472.
- Hankin, B. L., Mermelstein, R., & Roesch, L. (2007). Sex differences in adolescent depression: Stress exposure and reactivity models. *Child Development, 78*(1), 279-295.
- Haraldsdóttir, J., Thórsdóttir, I., Vaz de Almeida, M. D., Maes, L., Pérez-Rodrigo, C., Elmadfa, I., et al. (2005). Validity and reproducibility of a precoded questionnaire to assess fruit and vegetable intake in European 11- to 12-year-old schoolchildren. *Annals of Nutrition and Metabolism 49*, 221-227.
- Harnack, L., Stang, J., & Story, M. (1999). Soft drink consumption among US children and adolescents; nutritional consequences. *Journal of American Dietetic Association, 99*(4), 436-442.
- Hsieh, P. (2004). Factors influencing students' decisions to chose healthy or unhealthy snacks at the University of Newcastle, Australia. *Journal of Nursing Research, 12*(2), 83-90.
- Jacka, F. N., Kremer, P. J., Leslie, E. R., Berk, M., Patton, G. C., Toumbourou, J. W., et al. (2010). Associations between diet quality and depressed mood in adolescents: Results from the Australian neighbourhoods study. *Australian and New Zealand Journal of Psychiatry, 44*, 435-442.

- Jacka, F. N., Pasco, J. A., Henry, M. J., Kotowicz, M. A., Nicholson, G. C., & Berk, M. (2004). Dietary omega-3 fatty acids and depression in a community sample. *Nutritional Neuroscience*, 7(2), 101-106.
- Jacka, F. N., Pasco, J. A., Mykletun, A., Williams, L. J., Hodge, A. M., O'Reilly, S. L., et al. (2010). Association of western and traditional diets with depression and anxiety in women. *The American Journal of Psychiatry*, 167(3), 305-311.
- Jackson, G. E. (2006). Mental health screening in schools: Essentials of informed consent. *Ethical Human Psychology and Psychiatry*, 8(3), 217-226.
- Jackson, K. A., Byrne, N. M., Magarey, M., & Hills, A. P. (2008). Minimizing random error in dietary intakes assessed by 24-h recall, in overweight and obese adults. *European Journal of Clinical Nutrition*, 62, 537-543.
- Jain, M., Howe, G. R., & Rohan, T. (1996). Dietary assessment in epidemiology: Comparison of a food frequency and a diet history questionnaire with a 7-day food record. *American Journal of Epidemiology*, 143, 953-960.
- Jarvelaid, M. (2008). Breakfast skipping and associated biophysical factors among adolescents. *Papers on Anthropology XIII*, 78-85.
- Jaycox, L. H., Reivich, K. J., Gillham, J., & Seligman, M. E. P. (1994). Prevention of depressive symptoms in school children. *Behaviour Research and Therapy*, 32, 801-816.
- Ji, P. Y., Pokorny, S. B., & Jason, L. A. (2004). Factors influencing middle and high schools' active parental consent return rates. *Evaluation Review*, 28, 578-591.
- Jula, A., Seppanen, R., & Alanen, E. (1999). Influences of days of the week on reported food, macronutrient and alcohol intake among an adult population in south western Finland. *European Journal of Clinical Nutrition*, 52, 808-812.
- Kassem, N. O., & Lee, J. W. (2004). Understanding soft Drink consumption among male adolescents using the theory of planned behavior. *Journal of Behavioral Medicine*, 27(3), 273-296.

- Kercher, A. J., Rapee, R. M., & Schniering, C. A. (2009). Neuroticism, life events and negative thoughts in the development of depression in adolescent girls. *Journal of Abnormal Psychology, 37*, 903-915.
- Keski-Rahkonen, A., Kaprio, J., Rissanen, A., Virkkunen, M., & Rose, R. J. (2003). Breakfast skipping and health-compromising behaviors in adolescents and adults. *European Journal of Clinical Nutrition, 57*, 842-853.
- Khare, A., & Inman, J. J. (2009). Daily, week-part and holiday patterns in consumers' caloric intake. *Journal of Public Policy & Marketing, 28*(2), 234-252.
- Kinnunen, P., Laukkanen, E., Kiviniemi, V., & Kylmä, J. (2010). Associations between the coping self in adolescence and mental health in early adulthood. *Journal of Child and Adolescent Psychiatric Nursing, 23*(2), 111-117.
- Kort-Butler, L. A. (2009). Coping styles and sex differences in depressive symptoms and delinquent behavior. *Journal of Youth and Adolescence, 38*, 122-136.
- Kremer, P. J., Bell, A. C., & Swinburn, B. A. (2006). Calibration and reliability of a school food checklist: A new tool for assessing school food and beverage consumption. *Asia Pacific Journal of Clinical Nutrition, 14*(4), 465-473.
- Kristal, A. R., Abrams, B. F., Thornquist, M. D., Disogra, L., Croyle, R. T., Shatruck, A. L., et al. (1990). Development and validation of a food use checklist for evaluation of community nutrition interventions. *American Journal of Public Health, 80*, 1318-1322.
- Langhinrichsen-Rohling, J., Arata, C., O'Brien, N., Bowers, D., & Klibert, J. (2006). Sensitive research with adolescents: Just how upsetting are self-report surveys anyway? *Violence and Victims, 21*(4), 425-444.
- Larson, N. I., Neumark-Sztainer, D., Harnack, L. J., Wall, M. M., Story, M. T., & Eisenberg, M. E. (2008). Fruit and vegetable intake correlates during the transition to young adulthood. *American Journal of Preventive Medicine, 35*(1), 33-37.

- Leher, J. A., Shrier, L. A., Gortmaker, S., & Buka, S. (2006). Depressive symptoms as a longitudinal predictor of sexual risk behaviors among US middle and high school students. *Pediatrics*, 118(1), 189-200.
- Lehrer, J. A., Shrier, L. A., Gortmaker, S., & Buka, S. (2006). Depressive symptoms as a longitudinal predictor of sexual risk behaviors among US middle and high school students. *Pediatrics*, 118(1), 189-200.
- Lenzer, J. (2005). US teenager's parents sue school over depression screening test. *British Medical Journal*, 331(7519), 714.
- Li, C. E., DiGiuseppe, R., & Froh, J. (2006). The roles of sex, gender and coping in adolescent depression. *Adolescence*, 41(163), 409-415.
- Lien, L., Lien, N., Heyerdahl, S., Thoresen, M., & Bjertness, E. (2006). Consumption of soft drinks and hyperactivity, mental distress, and conduct problems among adolescents in Oslo, Norway. *American Journal of Public Health*, 96(10), 1815-1820.
- Liu, R. X. (2006). Vulnerability to friends' suicide influence: The moderating effects of gender and adolescent depression. *Journal of Youth and Adolescence*, 35(3), 479-489.
- Livingston, M. B. E., Robson, P. J., & Wallace, J. M. W. (2004). Issues in dietary intake assessment of children and adolescents. *British Journal of Nutrition*, 92(1), 213-222.
- Lubbe, A. M., & Bell, D. J. (2009). Mountain Dew® or Mountain Don't? A pilot investigation of caffeine use parameters and relations to depression and anxiety symptoms in 5th and 10th-grade students. *Journal of School Health*, 79(8), 380-387.
- Lytle, L. A., Nichaman, M. Z., Obarzanek, E., Glovsky, E., Montgomery, D., Nicklas, N., et al. (1993). Validation of 24-hour recalls assisted by food records in third-grade children. *Journal of the American Dietetic Association*, 93(12), 1431-1437.
- Lytle, L. A., Varnell, S., Murray, D. M., Story, M., Perry, C., Birnbaum, A. S., et al. (2003). Predicting adolescents' intake of fruit and vegetables. *Journal of Nutrition Education Behavior*, 35(4), 170-178.

- Magg, J. W., & Irvin, D. M. (2005). Alcohol use and depression among African-American and Caucasian adolescents. *Adolescence*, 40(157), 87-101.
- Marchioni, D. M. L., Voci, S. M., Leite de Lima, F. M., Fisberg, R. M., & Slater, B. (2007). Reproducibility of a food frequency questionnaire for adolescents. *Cad. Saúde Pública*, 23(9), 2187-2196.
- Martens, M. K., Van Assema, P., & Brug, J. (2005). Why do adolescents eat what they eat? Personal and social environmental predictors of fruit, snack and breakfast consumption among 12-14 year-old Dutch students. *Public Health Nutrition*, 8(8), 1258-1265.
- Martin, K., Rosenberg, M., Miller, M., French, S., McCormack, G., Bull, F., et al. (2009). *Child and Adolescent Physical Activity and Nutrition Survey 2008: Key findings*. Western Australian Government: Perth.
- Matheson, D. M., Killen, J. D., Wang, Y., Varady, A., & Robinson, T. N. (2004). Children's food consumption during television viewing. *American Journal of Clinical Nutrition*, 79, 1088 –1094.
- Matthys, C., Pynaert, I., De Keyzer, W., & De Henauw, S. (2007). Validity and reproducibility of an adolescent web-based food frequency questionnaire. *Journal of the American Dietetic Association* 107, 605-610.
- Mazza, J. J., Abbott, R. A., Flemong, C. B., Harachi, T. W., Cortes, R. C., Park, J., et al. (2009). Early predictors of adolescent depression: A 7-year longitudinal study. *The Journal of Early Adolescence*, 29(5), 664-692.
- Meadows, S. O., Brown, J. S., & Elder, G. H. (2006). Depressive symptoms, stress and support: Gendered trajectories from adolescence to young adulthood. *Journal of Youth and Adolescence*, 35(1), 93-103.
- Melnyk, B. M., Small, L., Morrison-Beedy, D., Strasser, A., Kreipe, R., Jacobson, D., et al. (2006). Mental health correlates of healthy lifestyle attitudes, beliefs, choices and behaviors in overweight adolescents. *Journal of Pediatric Health Care*, 20(6), 401-406.

- Messina, F., Saba, A., Vollono, C., Leclercq, C., & Piccinelli, R. (2004). Beliefs and attitudes towards the consumption of sugar free products in a sample of Italian adolescents. *European Journal of Clinical Nutrition*, 58, 420-428.
- Miller, S. A., Tavera, E. M., Rifas-Shiman, S. L., & Gillman, M. W. (2008). Association between television viewing and poor diet quality in young children. *International Journal of Pediatric Obesity*, 3, 168-176.
- Monahan, K. C., & Lee, J. M. (2008). Adolescent sexual activity: Links between regional context and depressive symptoms. *Journal of Youth and Adolescence*, 37, 917-927.
- Muir, K., Mullan, K., Powell, A., Flaxman, S., Thompson, D., & Griffiths, M. (2009). *State of Australia's Young People: A report on the social, economic, health and family lives of young people*. Australian Government: Office for Youth.
- Mullenbach, V., Kushi, L. H., Jacobson, C., Gomez-Marin, O., Prineas, R. J., Roth-Yousey, L., et al. (1992). Comparison of 3-day food record and 24-hour recall by telephone for dietary evaluation in adolescents. *Journal of the American Dietetic Association*, 92(6), 743-777.
- Munafo, M. R., Hitsman, B., Rende, R., Metcalfe, C., & Niaura, R. (2007). Effects of progression to cigarette smoking on depressed mood in adolescents: Evidence from the National Longitudinal Study of Adolescent Health. *Addiction*, 103, 162-171.
- Nelson, M., Atkinson, M., & Darbyshire, S. (1994). Food photography. I: The perception of food portion size from photographs. *British Journal of Nutrition*, 72, 649-663.
- Nelson, M., Atkinson, M., & Darbyshire, S. (1996). Food photography II: Use of food photographs for estimating portion size and the nutrient content of meals. *British Journal of Nutrition*, 76, 31-49.
- Neuhouser, M. L., Lilley, S., Lund, A., & Johnson, D. B. (2009). Development and validation of a beverage and snack questionnaire for use in evaluation of school nutrition policies. *Journal of the American Dietetic Association*, 109, 1587-1592.
- Neumark-Sztainer, D., Story, M., Ackard, D. M., Moe, J., & Perry, C. (2000). Family meals among adolescents: findings from a pilot study. *Journal of Nutrition Education*, 32(6), 335-340.

- Newman, B. M., Newman, P. R., Griffen, S., O'Connor, K., & Spas, J. (2007). The relationship of social support to depressive symptoms during the transition to high school. *Adolescence*, 42(167), 441-459.
- Nicklas, T. A., Farris, R. P., Bao, W., Webber, L. S., & Berenson, G. S. (1997). Differences in reported dietary intake of 10-year-old children on weekdays compared to Sunday: The Bogalusa heart study. *Nutrition Research*, 17(1), 31-40.
- Nielsen, S. J., Siega-Riz, A. M., & Popkin, B. M. (2002). Trends in food locations and sources among adolescents and young adults. *Preventive Medicine*, 35, 107-113.
- O'Sullivan, T., A., Robinson, M., Kendall, G. E., Miller, M., Jacoby, P., Silburn, S. R., et al. (2008). A good-quality breakfast is associated with better mental health in adolescence. *Public Health Nutrition*, 12(2), 249-258.
- O'Dea, J. (2003). Why do kids eat healthful food? Perceived benefits of and barriers to healthful eating and physical activity among children and adolescents. *Journal of the American Dietetic Association*, 103(4), 497-501.
- Oddy, W. H., Robinson, M., Ambrosini, G. L., O'Sullivan, T. A., De Klerk, N. H., Beilin, L. J., et al. (2009). The association between dietary patterns and mental health in early adolescence. *Preventive Medicine*, 49, 39-44.
- Ohannessian, C. M., Hesselbrock, V. M., Kramer, J., Kuperman, S., Bucholz, K. K., Schuckit, M. A., et al. (2005). The relationship between parental psychopathology and adolescent psychopathology: An examination of gender patterns. *Journal of Emotional and Behavioral Disorders*, 13(2), 67-76.
- Owens, T. J., Shippee, N. D., & Hensel, D. J. (2008). Emotional distress, drinking and academic achievement across the adolescent life course. *Journal of Youth and Adolescence*, 37, 1242-1256.
- Palaniappan, U., Cue, R. I., Payette, H., & Gray-Donald, K. (2003). Implications of day-to-day variability on measurements of usual food and nutrient intakes. *Journal of Nutrition*, 133, 232-235.

- Papadopoulou, S. K., Barboukis, V., Dalkiranis, A., Hassapidou, M., Petridou, A., & Mougios, V. (2008). Validation of a questionnaire assessing food frequency and nutritional intake in Greek adolescents. *International Journal of Food Sciences and Nutrition*, 59(2), 148-154.
- Parker, G., & Roy, K. (2001). Adolescent depression: A review. *Australian and New Zealand Journal of Psychiatry*, 35, 572-580.
- Patrick, H., & Nicklas, T. A. (2005). A review of family and social determinants of children's eating patterns and diet quality. *Journal of the American College of Nutrition*, 24(2), 83-92.
- Pearce, M. J., Little, T. D., & Perez, J. E. (2003). Religiousness and depressive symptoms among adolescents. *Journal of Clinical Child and Adolescent Psychology*, 32(2), 267-276.
- Pokorny, S. B., Jason, L. A., Schoeny, M. E., Townsend, S. M., & Curie, C. J. (2001). Do participation rates change when active consent procedures replace passive consent? *Evaluation Review*, 25, 567-580.
- Post, B., Kemper, H. C. G., & Essen, L. S.-V. (1987). Longitudinal changes in nutritional habits of teenagers: differences in intake between schooldays and weekend days. *British Journal of Nutrition*, 57, 161-176.
- Poulin, C., Hand, D., Boudreau, B., & Santor, D. (2005). Gender differences in the association between substance use and elevated depressive symptoms in a general adolescent population. *Addiction*, 100, 525-535.
- Puskar, K. R., Sereika, S. M., Lamb, J., Tusaie-Mumford, K., & McGuinness, T. (1999). Optimism and its relationship to depression, coping, anger and life events in rural adolescents. *Issues in Mental Health Nursing*, 20, 115-130.
- Radcliffe, B. C., Ogden, C., Coyne, T., & Craig, P. (2004). Breakfast consumption patterns of upper primary school students in 14 Queensland schools. *Nutrition & Dietetics*, 61(3), 151-158.
- Rangan, A. M., Randall, D., Hector, D. J., & Webb, K. L. (2008). Consumption of 'extra' foods by Australian children: Types, quantities and contribution to energy and nutrient intake. *European Journal of Clinical Nutrition*, 62, 356-364.

- Range, L. M., Embry, T., & MacLeod, T. (2001). Active and passive consent: A comparison of actual research with children. *Ethical Human Sciences and Services*, 3, 23-31.
- Raphael, B. (2000). Promoting the mental health and wellbeing of children and young people. Discussion paper: Key principles and directions. *National Mental Health Working Group, Department of Health and Aged Care, Canberra*.
- Rew, L., Thomas, N., Horner, S. D., Resnick, M. D., & Beuhring, T. (2001). Correlates of recent suicide attempts in a triethnic group of adolescents. *Journal of Nursing Scholarship* 33(4), 361-367.
- Rey, J., Sawyer, M. G., Raphael, B., Patton, G. C., & Lynskey, M. (2002). Mental health of teenagers who use cannabis: Results of an Australian survey. *British Journal of Psychiatry*, 180, 216-221.
- Rhodes, D. G., Cleveland, L. E., Murayi, T., & Moshfegh, A. J. (2007). The effect of weekend eating on nutrient intakes and dietary patterns. *The Federation of American Societies for Experimental Biology Journal*, 21, 835-840.
- Richardson, A. J. (2003). The importance of omega-3 fatty acids for behaviour, cognition and mood. *Scandinavian Journal of Nutrition* 47(2), 92-98.
- Riittakerttu, K. H., Kosunen, E., & Rimpela, M. (2003). Pubertal timing, sexual behaviour and self reported depression in middle adolescence. *Journal of Adolescent Health*, 26, 531-545.
- Robson, P. J., Barbara, M., & Livingstone, E. (1999). An evaluation of food photographs as a tool for quantifying food and nutrient intakes. *Public Health Nutrition*, 3(2), 183-192.
- Rockett, H. R., Breitenbach, M., Frazier, L., Witschi, J., Wolf, A. M., Field, A. E., et al. (1997). Validation of a youth/adolescent food frequency questionnaire. *Preventive Medicine*, 26, 808-816.
- Rowe, L., Bennett, D., & Tonge, B. (2009). *I just want you to be happy: Preventing and tackling teenage depression*. Sydney: Allen & Unwin.
- Ryan, N. D. (2005). Treatment of depression in children and adolescents. *Lancet*, 366, 933-940.
- Savage, G. S., Ball, K., Worsley, A., & Crawford, D. (2007). Food intake patterns among Australian adolescents. *Asia Pacific Journal of Clinical Nutrition*, 16(4), 738-747.

- Sawyer, M. G., Miller-Lewis, L. R., & Clark, J. J. (2007). The mental health of 13-17 year-olds in Australia: Findings from the national survey of mental health and well-being. *Journal of Youth and Adolescence*, 36, 185-194.
- Sawyer, M. G., Pfeiffer, S., & Spence, S. H. (2009). Life events, coping and depressive symptoms among young adolescents A one-year prospective study. *Journal of Affective Disorders*, 117, 48-54.
- Scully, M., Dixon, H., White, V., & Beckmann, K. (2007). Dietary, physical activity and sedentary behaviour among Australian secondary students. *Health Promotion International*, 22(236-245).
- Sepp, H., Lennernas, M., & Abrahamsson, L. (2006). Preschool children's meal patterns analysed using the food-based classification of eating episodes model. *Scandinavian Journal of Food & Nutrition*, 50(3), 131-138.
- Serdula, M. K., Alexander, M. P., Scanlon, K. S., & Bowman, B. A. (2001). What are preschool children eating? A review of dietary assessment. *Annual Review of Nutrition*, 21, 475-498.
- Shahar, G., Henrich, C. C., Winokur, A., Blatt, S. J., Kuperminc, G. P., & Leadbeater, B. J. (2006). Self-criticism and depressive symptomology interact to predict middle school academic achievement. *Journal of Clinical Psychology*, 62(1), 147-155.
- Shochet, I. M., Dadds, M. R., Holland, D., Whitefield, K., Harnett, P. H., & Osgarby, S. M. (2001). The efficacy of a universal school-based program to prevent adolescent depression. *Journal of Clinical Child Psychology*, 30(3), 303-315.
- Shochett, I. M., & O'Gorman, J. G. (1995). Ethical issues in research on adolescent depression and suicidal behaviour. *Australian Psychologist*, 30(3), 183-186.
- Sjoberg, A., Hallberg, L., & Hulthen, L. (2003). Meal pattern, food choice, nutrient intake and lifestyle factors in the goteborg adolescent study. *European Journal of Clinical Nutrition*, 57, 1569-1578.
- Sjoberg, A., & Hulthen, L. (2004). Assessment of habitual meal pattern and intake of foods, energy and nutrients in Swedish adolescent girls: Comparison of diet history with 7-day record. *European Journal of Clinical Nutrition*, 58, 1181-1189.

- Sjoberg, A., Slinde, F., Arvidsson, D., Ellegard, L., Gramatkovski, E., Hallberg, L., et al. (2003). Energy intake in Swedish adolescents: Validation of diet history with doubly labeled water. *European Journal of Clinical Nutrition*, 57, 1643-1652.
- Skinner, S. R., Smith, J., Fenwick, J., Fyfe, S., & Hendriks, J. (2008). Perceptions and experiences of first sexual intercourse in Australian adolescent females. *Journal of Adolescent Health*, 43, 593-599.
- Slade, T., Johnston, A., Teesson, M., Whiteford, H., Burgess, P., Pirkis, J., et al. (2009). *The Mental Health of Australians 2. Report on the 2007 National Survey of Mental Health and Wellbeing*. Department of Health and Ageing: Commonwealth of Australia
- Slater, B., Phillipi, S. T., Fisberg, R. M., & Latorre, M. (2003). Validation of a semi-quantitative adolescent food frequency questionnaire applied at a public school in Sao Paulo, Brazil. *European Journal of Clinical Nutrition*, 57, 629-635.
- Small, L., Sidora-Arcoleo, K., Vaughan, L., Creed-Capsel, J., Chung, K. Y., & Stevens, C. (2009). Validity and reliability of photographic diet diaries for assessing dietary intake among young children. *Infant, Child & Adolescent Nutrition*, 1(1), 27-36.
- Smith, A., Agius, P., Mitchell, A., Barrett, C., & Pitts, M. (2009). *Secondary Students and Sexual Health 2008*. Australian Research Centre in Sex, Health & Lifestyle: La Trobe University, Melbourne.
- Smith, A., Kellet, E., & Schmerlaib, Y. (1998). *The Australian Guide to Healthy Eating*. Department of Health and Ageing: Commonwealth of Australia.
- Stanard, R. P. (2000). Assessment and treatment of adolescent depression and suicidality. *Journal of Mental Health Counseling*, 22, 204-217.
- Stein, B. D., Jaycox, L. H., Langley, A., Kataoka, S. H., Wilkins, W. S., & Wong, M. (2007). Active parental consent for a school-based community violence screening: Comparing distribution methods. *Journal of School Health*, 77(3), 116-120.
- Stemmler, M., & Petersen, A. C. (2005). Gender differential influences of early adolescent risk factors for the development of depressive affect. *Journal of Youth and Adolescence*, 34(3), 175-183.

- Storey, K. E., Hanning, R. M., Lambraki, I. A., Driezen, P., Fraser, S. N., & McCargar, L. J. (2009). Determinants of diet quality among Canadian adolescents. *Canadian Journal of Dietetic Practice and Research, 70*(2), 58-65.
- Sun, R. C. F., & Hui, E. K. P. (2007). Psychosocial factors contributing to adolescent suicidal ideation. *Journal of Youth and Adolescence, 36*, 775-786.
- Tam, C. S., Garnett, S. P., Cowell, C. T., Campbell, K., Cabrera, G., & Baur, L. A. (2006). Soft drink consumption and excess weight gain in Australian school students: Results from the Nepean study. *International Journal of Obesity, 30*, 1091-1093.
- Tausig, M., Michello, J., & Subedi, S. (2004). *A sociology of mental illness* (2nd ed.). New Jersey: Pearson Education Inc.
- Taylor, R., Page, A., Morrell, S., Harrison, J., & Carter, G. (2005). Mental health and socio-economic variations in Australian suicide. *Social Science & Medicine, 61*, 1551-1559.
- Thompson, F. E., & Byers, T. (1994). Dietary assessment resource manual. *Journal of the American Institute of Nutrition, 124*, 2245S-2317S.
- Thompson, F. E., & Subar, A. F. (2001). Dietary Assessment Methodology. In *Nutrition in the Prevention and Treatment of Disease* (pp. 3-39). San Diego: Academic Press.
- Thompson, F. E., Subar, A. F., Brown, C. C., Smith, A. F., Sharbaugh, C. O., Jobe, J. B., et al. (2002). Cognitive research enhances accuracy of food frequency questionnaire reports: Results of an experimental validation study. *Journal of American Dietetic Association, 102*(2), 212-225.
- Thomson, M., Spence, J. C., Raine, K., & Laing, L. (2008). The association of television viewing with snacking behavior and body weight of young adults. *American Journal of Health Promotion, 22*(5), 329-335.
- Tigges, B. B. (2003). Parental consent and adolescent risk behaviour research. *Journal of Nursing Scholarship, 35*(3), 283-289.
- Tomlinson, D., Wilkinson, H., & Wilkinson, P. (2009). Diet and mental health in children. *Child and Adolescent Mental Health, 14*(3), 148-155.

- Tomori, M., & Rus-Makovec, M. (2000). Eating behavior, depression and self esteem in high school students. *Journal of Adolescent Health, 26*(5), 361-367.
- Unger, J. B., Gallaher, P., Palmer, P. H., Baezconde-Garbanati, L., Trinidad, D. R., Cen, S., et al. (2004). Now news is bad news: Characteristics of adolescents who provide neither parental consent nor refusal for participation in school-based research. *Evaluation Review, 28*, 52-63.
- Van Voorhees, B. W., Paunesku, D., Kuwabara, S. A., Basu, A., Gollan, J., Hankin, B. L., et al. (2008). Protective and vulnerability factors predicting new onset depressive episode in a representative of U.S adolescents. *Journal of Adolescent Health, 42*, 605-616.
- Videon, T. M., & Manning, C. K. (2003). Influences on adolescent eating patterns: The importance of family meals. *Journal of Adolescent Health, 32*(5), 365-373.
- Waldrop, A. E., Hanson, R. F., Resnick, H. S., Kilpatrick, D. G., Naugle, A. E., & Saunders, B. E. (2007). Risk factors for suicidal behavior among a national sample of adolescents: Implications for prevention. *Journal of Traumatic Stress, 20*(5), 869-879.
- Walker, L. R., Abraham, A. A., & Tercyak, K. P. (2010). Adolescent caffeine use, ADHD and cigarette smoking. *Children's Health Care, 39*, 73-90.
- Walker, M. W., Hallfors, D. D., Halpern, C. T., Iritani, B. J., Ford, C. A., & Guo, G. (2006). Gender differences in associations between depressive symptoms and patterns of substance use and risky sexual behavior among a nationally representative sample of U.S. adolescents. *Archives Womens Mental Health 9*, 139-150
- Ward, S., Sylva, J., & Gresham, F. M. (2010). School-based predictors of early adolescent depression. *School Mental Health, 2*, 125-131.
- Watson, J. F., Collins, C. E., Sibbritt, D. W., Dibley, M. J., & Garg, M. L. (2009). Reproducibility and comparative validity of a food frequency questionnaire for Australian children and adolescents. *International Journal of Behavioral Nutrition and Physical Activity, 6*(62).
- Weissman, M. M., Wickramaratne, P., Nomura, Y., Warner, V., Pilowsky, D., & Verdeli, H. (2006). Offspring of depressed parents: 20 years later. *American Journal of Psychiatry, 163*, 1001-1008.

- Weist, M. D., Rubin, M., Moore, E., Adelsheim, S., & Wrobel, G. (2007). Mental health screening in schools. *Journal of School Health*, 77, 53-58.
- Wiles, N. J., Northstone, K., Emmett, P., & Lewis, G. (2009). 'Junk food' diet and childhood behavioural problems: Results from the ALSPAC cohort. *European Journal of Clinical Nutrition*, 63(4), 491-498.
- Wolfenden, L., Kyri, K., Freund, M., & Hodder, R. (2009). Obtaining active parental consent for school-based research: A guide to researchers. *Australian and New Journal of Public Health*, 33(3), 270-275.
- Woo, B. S., Chang, W. C., Fung, D. S., Koh, J. B., Leong, J. S., Kee, C. H., et al. (2004). Development and validation of a depression scale for Asian adolescents. *Journal of Adolescence*, 27, 677-689.
- World Health Organisation. (2009). Adolescent Health. *Child and Adolescent Mental Health Resources*.
- World Health Organization. (2008). *Mental Health Gap Action Programme: Scaling up care for mental, neurological, and substance use disorders*. World Health Organization: Geneva.
- World Health Organization. (2009). *Mental health programs and projects*. World Health Organization: Geneva.
- Wright, L. S., Frost, C. J., & Wisecarver, S. J. (1993). Church attendance, meaningfulness of religion, and depressive symptomatology among adolescents. *Journal of Youth and Adolescence*, 22(5), 559-568.
- Yap, M. B. H., Allen, N. B., & Ladouceur, C. D. (2008). Maternal socialization of positive affect: The impact of invalidation on adolescent emotion regulation and depressive symptomatology. *Child Development*, 79(5), 1415-1431.
- Young, J. F., Berenson, K., Cohen, P., & Garcia, J. (2005). The role of parent and peer support in predicting adolescent depression: A longitudinal community study. *Journal of Research on Adolescence*, 15(4), 407-423.
- Zhou, S. J., Schilling, M. J., & Makrides, M. (2005). Evaluation of an iron specific checklist for the assessment of dietary iron intake in pregnant and postpartum women. *Nutrition* 21, 908-913.

Zumin, S., Taylor, A. W., Wittert, G., Goldney, R., & Gill, T. K. (2010). Soft drink consumption and mental health problems among adults in Australia. *Public Health Nutrition*, 13(7), 1073-1079.

Appendix 1



THE UNIVERSITY OF
NOTRE DAME
A U S T R A L I A

DAILY FOOD LIST

CODE:

(Grade, street number, birthday date, first letter of street name)

Day of recall: _____

HOW TO COMPLETE THE DAILY FOOD LIST

- 1. Recall the food and drink you have consumed the previous day**
- 2. Fill in the box for each serving of the food or drink you have consumed**

EXAMPLE

Sweet biscuits

1 serving = 2 sweet biscuits

How many servings? ☒ ☐ ☐ ☐ ☐ ☐

I ate 2 sweet biscuits yesterday

Sweet biscuits

1 serving = 2 sweet biscuits

How many servings? ☒ ☐ ☐ ☐ ☐ ☐

I ate 1 sweet biscuit yesterday

Sweet biscuits

1 serving = 2 sweet biscuits

How many servings? ☒ ☐ ☐ ☐ ☐ ☐

I ate ½ sweet biscuit yesterday

Read the serving size carefully because each one is different!

Please ask if you unsure about what serving size you have consumed.

MORNING: BREAKFAST TO LUNCH (BREAKFAST, RECESS & SNACKS)

Did you eat breakfast? YES or NO (please circle)

TAKE AWAY FOODS

Hamburger/fish burger/chicken burger with bun from a fast food outlet only

1 serving = 1 hamburger/fish burger/chicken burger

How many servings? ☐☐☐☐☐☐



Pizza from a fast food outlet only

1 serving = 1 slice of pizza

How many servings? ☐☐☐☐☐☐



Fried chicken (e.g. from chicken treat, red rooster, chooks, or similar)

1 serving = quarter of a chicken or 2 drumsticks

How many servings? ☐☐☐☐☐☐



Sausage roll

1 serving = 1 medium sized sausage roll or 2 bite size (party) sausage rolls

How many servings? ☐☐☐☐☐☐



Meat pie

1 serving = 1 meat pie or 2 bite size (party) meat pies

How many servings? ☐☐☐☐☐☐



Fried or battered fish only

1 serving = 1 piece of fish

How many servings? ☐☐☐☐☐☐



Hot chips or French fries

1 serving = 1 small fries

How many servings?



Potato gems or wedges

1 serving = 10 gems/wedges

How many servings?



DRINKS

Soft drink

1 serving = 1 375ml can

How many servings?



Diet Soft drink

1 serving = 1 375ml can

How many servings?



Milkshake or thickshake

1 serving = 1 small drink

How many servings?



Energy drink (e.g. Redbull, V or Mother)

1 serving = 1 can

How many servings?



Cordial

1 serving = 1 glass

How many servings?



PARTY FOODS

Lollies or confectionary

1 serving = 1 packet of lollies

How many servings? **Chocolate**

1 serving = 1 small block (250g)

How many servings? **Chocolate bar**

1 serving = 1 chocolate bar or 2 fun size bars

How many servings? **Potato crisps**

1 serving = 1 small packet of crisps

How many servings? **Ice cream or Icy pole**

1 serving = 1 ice cream/icy pole stick or 1 scoop ice cream in cone

How many servings? 

SNACK FOODS

LCM/Muesli bar/muffin bars

1 serving = 1 bar

How many servings? 

Sweet bun (e.g. 'sticky' bun, cinnamon scroll)

1 serving = 1 bun

How many servings?



Cake

1 serving = 1 slice of cake

How many servings?



Sweet muffin

1 serving = 1 muffin

How many servings?



Doughnut

1 serving = 1 doughnut

How many servings?



Sweet pie or pastry

1 serving = 1 sweet pie or pastry

How many servings?



Croissant

1 serving = 1 croissant

How many servings?



Sweet biscuits

1 serving = 2 sweet biscuits

How many servings?



AFTERNOON: LUNCH TO BEFORE BED (LUNCH, AFTERNOON TEA & SNACKS)

TAKE AWAY FOODS

Hamburger/fish burger/chicken burger with bun from a fast food outlet only

1 serving = 1 hamburger/fish burger/chicken burger

How many servings?



Pizza from a fast food outlet only

1 serving = 1 slice of pizza

How many servings?



Fried chicken (e.g. from chicken treat, red rooster, chooks, or similar)

1 serving = quarter of a chicken or 2 drumsticks

How many servings?



Sausage roll

1 serving = 1 medium sized sausage roll or 2 bite size (party) sausage rolls

How many servings?



Meat pie

1 serving = 1 meat pie or 2 bite size (party) meat pies

How many servings?



Fried or battered fish only

1 serving = 1 piece of fish

How many servings?



Hot chips or French fries

1 serving = 1 small fries

How many servings?



Potato gems or wedges

1 serving = 10 gems/wedges

How many servings?



DRINKS

Soft drink

1 serving = 1 375ml can

How many servings?



Diet Soft drink

1 serving = 1 375ml can

How many servings?



Milkshake or thickshake

1 serving = 1 small drink

How many servings?



Energy drink (e.g. Redbull, V or Mother)

1 serving = 1 can

How many servings?



Cordial

1 serving = 1 glass

How many servings?



PARTY FOODS

Lollies or confectionary

1 serving = 1 packet of lollies

How many servings? **Chocolate**

1 serving = 1 small block (250g)

How many servings? **Chocolate bar**

1 serving = 1 chocolate bar or 2 fun size bars

How many servings? **Potato crisps**

1 serving = 1 small packet of crisps

How many servings? **Ice cream or Icy pole**

1 serving = 1 ice cream/icy pole stick or 1 scoop ice cream in cone

How many servings? 

SNACK FOODS

LCM/Muesli bar/muffin bars

1 serving = 1 bar

How many servings? 

Sweet bun (e.g. 'sticky' bun, cinnamon scroll)

1 serving = 1 bun

How many servings?



Cake

1 serving = 1 slice of cake

How many servings?



Sweet muffin

1 serving = 1 muffin

How many servings?



Doughnut

1 serving = 1 doughnut

How many servings?



Sweet pie or pastry

1 serving = 1 sweet pie or pastry

How many servings?



Croissant

1 serving = 1 croissant

How many servings?



Sweet biscuits

1 serving = 2 sweet biscuits

How many servings?



EVENING: DINNER TO BED (DINNER, DESSERT & SNACKS)

TAKE AWAY FOODS

Hamburger/fish burger/chicken burger with bun from a fast food outlet only

1 serving = 1 hamburger/fish burger/chicken burger

How many servings?



Pizza from a fast food outlet only

1 serving = 1 slice of pizza

How many servings?



Fried chicken (e.g. from chicken treat, red rooster, chooks, or similar)

1 serving = quarter of a chicken or 2 drumsticks

How many servings?



Sausage roll

1 serving = 1 medium sized sausage roll or 2 bite size (party) sausage rolls

How many servings?



Meat pie

1 serving = 1 meat pie or 2 bite size (party) meat pies

How many servings?



Fried or battered fish only

1 serving = 1 piece of fish

How many servings?



Hot chips or French fries

1 serving = 1 small fries

How many servings?



Potato gems or wedges

1 serving = 10 gems/wedges

How many servings?



DRINKS

Soft drink

1 serving = 1 375ml can

How many servings?



Diet Soft drink

1 serving = 1 375ml can

How many servings?



Milkshake or thickshake

1 serving = 1 small drink

How many servings?



Energy drink (e.g. Redbull, V or Mother)

1 serving = 1 can

How many servings?



Cordial

1 serving = 1 glass

How many servings?



PARTY FOODS

Lollies or confectionary

1 serving = 1 packet of lollies

How many servings? **Chocolate**

1 serving = 1 small block (250g)

How many servings? **Chocolate bar**

1 serving = 1 chocolate bar or 2 fun size bars

How many servings? **Potato crisps**

1 serving = 1 small packet of crisps

How many servings? **Ice cream or Icy pole**

1 serving = 1 ice cream/icy pole stick or 1 scoop ice cream in cone

How many servings? 

SNACK FOODS

LCM/Muesli bar/muffin bars

1 serving = 1 bar

How many servings? 

Sweet bun (e.g. 'sticky' bun, cinnamon scroll)

1 serving = 1 bun

How many servings? ☐☐☐☐☐☐



Cake

1 serving = 1 slice of cake

How many servings? ☐☐☐☐☐☐



Sweet muffin

1 serving = 1 muffin

How many servings? ☐☐☐☐☐☐



Doughnut

1 serving = 1 doughnut

How many servings? ☐☐☐☐☐☐



Sweet pie or pastry

1 serving = 1 sweet pie or pastry

How many servings? ☐☐☐☐☐☐



Croissant

1 serving = 1 croissant

How many servings? ☐☐☐☐☐☐



Sweet biscuits

1 serving = 2 sweet biscuits

How many servings? ☐☐☐☐☐☐



THANK YOU FOR COMPLETING THE DAILY FOOD LIST TODAY!

Appendix 2

CODE:

(Grade, street number, birthday date, first letter of street name)

Below is a list of the ways you might have felt or behaved. Please tell me how often you have felt this way during the past week.

	During the Past			
Week				
	Rarely or none of the time (less than 1 day)	Some or a little of the time (1-2 days)	Occasionally or a moderate amount of time (3-4 days)	Most or all of the time (5-7 days)
1. I was bothered by things that usually don't bother me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. I did not feel like eating; my appetite was poor.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I felt that I could not shake off the blues even with help from my family or friends.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I felt I was just as good as other people.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I had trouble keeping my mind on what I was doing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I felt depressed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. I felt that everything I did was an effort.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. I felt hopeful about the future.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I thought my life had been a failure.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I felt fearful.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. My sleep was restless.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. I was happy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. I talked less than usual.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. I felt lonely.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. People were unfriendly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. I enjoyed life.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. I had crying spells.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. I felt sad.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. I felt that people dislike me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. I could not get "going."	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix 3



INFORMATION LETTER FOR STUDENTS

Extra Food Intake and Depressive Symptoms in Adolescents: Is there a relationship?

Dear Student,

My name is Elisabeth Bradshaw and I am from The University of Notre Dame Australia. I would like to invite you to take part in a research project that I am doing. I would like to find out if there is a relationship between the food young people eat and their mental health.

I am asking for your help with the project because I would like to determine if this relationship exists in adolescents, such as yourself. I will be asking all students at your school from grade 8 to 12 to be involved in this research.

If you would like information about mental health, visit www.beyondblue.org.au

What would I be asked to do?

If you agree to take part, you will be asked to complete a daily food list and a questionnaire about how you are feeling. The daily food list will be done once, each school day during class time for a week. You will given a new daily food list each day in class for you to complete. I will ask you to record the food and drink you have consumed the previous day. You will also be asked to complete a questionnaire about how you are feeling. This should only take you 5 to 10 minutes.

Do I have to take part?

You are free to say yes or no. I will respect your decision whichever choice you make, and I will not question it.

Participating in this research will not affect your grades, your relationship with your teacher(s), or with your school.

What if I wanted to change my mind?

If you say no, but then change your mind and want to take part, contact me and I will let you know if you can still join in.

If you say yes, but then want to stop participating, that's OK. Just let your teacher or me know and you can withdraw any time.

You can stop participating in this research at any time.

What will happen to the information I give - is it private and confidential?

Information that identifies you will be removed from the data collected. I will give you a code which will match your name on a participant list. I will be the only one to see this list. If your answers to the questionnaire suggest you are feeling upset or are concerning me, I will contact your parents in writing. Again, I will be the only one to see your responses; they will not be released to the school. The data that I collect is then stored securely in a locked filing cabinet and can only be accessed by myself. The data will be stored for a minimum period of 5 years. Records are destroyed immediately after this period, unless the law requires them to be held longer.

After I have collected all the information for the project and analysed all of it, I intend to write about what I found and publish it in a journal which is read by other researchers. When I do this, I won't write or tell anyone your name, or the names of any other students or your school.

A summary of the project will be made available to your school when it is completed. You can also ask for a copy by contacting myself on the details listed below. The summary should be available in November 2010.

The information you provide for this project will be used only for this project, and will not be used in any future research without first asking you and your parents/carers if I can use it again.

Will you tell anyone what I say while I am contributing to the project?

In most situations, I will treat what you tell me as being private and confidential (I won't tell anyone unless you agree that I should). If you tell me something that concerns me in your questionnaire, I will let your parents know in writing. If you tell me something that I need to tell someone else because the law requires me to do so, then I will have to. I may also have to reveal something you say to me if I think that you might be being mistreated by someone. If this happens I will make sure that someone will come and talk with you about it.

Is this research approved?

The research has been approved by the Human Rights Ethics Committee of The University of Notre Dame and has met the policy requirements of the Department of Education and Training.

Who do I contact if I wish to talk about the project further?

Please talk about the project with your parents first. Then, if you would like to talk with me more, please contact me on the number provided below. If, at any time, you wish to speak with a person who is not involved in the project about how something was handled, please contact Lorraine Mayhew on 9433 0941.

OK – so how do I become involved?

You have already discussed the project and what it means to take part with at least one of your parents. Now you can say for yourself.

If you **do** want to be a part of the project, then please read the next page and write your name in the space provided. **Please return the consent form by Friday 21st May.**

I will also be asking your parents for permission for you to take part in this research.

This letter is for you to keep.

Elisabeth Bradshaw

College of Health Sciences Masters Student

The University of Notre Dame Australia

Phone: 0422 122 919

Email: ebroadshaw@student.nd.edu.au



CONSENT FORM FOR STUDENTS

Extra Food Intake and Depressive Symptoms in Adolescents: Is there a relationship?

- I know that I don't have to be involved in this project, but I would like to be.
- I know that I will be completing a daily food list and a mental health questionnaire as part of the project.
- I understand I am free to stop and withdraw from the project at any time
- I understand that participating in this project will not affect my grades, my relationship with my teacher(s) or with my school.
- I understand that I need to sign my name in the space below, before I can be a part of the project.

Name of Participant (printed):

Signature of Participant:

Date: / /

Grade of student:

Date of birth:

Please ensure that your consent form and your parent's consent form are returned together.



INFORMATION LETTER FOR PARENTS

Extra Food Intake and Depressive Symptoms in Adolescents: Is there a relationship?

Dear Parent/Carer,

My name is Elisabeth Bradshaw and I am writing to you on behalf of The University of Notre Dame Australia. I am conducting a research project that aims to determine if there is a relationship between the food young people eat and their mental health. The project is being conducted as part of a Masters for Health Science research project.

I would like to invite your child to take part in the project. This is because I would like to determine if this relationship exists in adolescents. Your child has also been provided with a letter from us that we encourage you to discuss with him/her.

If you would like information about mental health, visit www.beyondblue.org.au

Research procedure

Participation in the project will involve your child completing a daily food list, and a questionnaire about how they are feeling. The daily food list will be completed once each school day during class time for a week. Your child will be given a new daily food list at each class and will be asked to record the food and drink they have consumed the previous day. The daily food list will take no longer than 5 to 10 minutes to complete and will not interfere with their school work. Your child will also be asked to complete a questionnaire about how you are feeling. This should only take you 5 to 10 minutes.

Participation is voluntary and your decision will be respected. Your decision will not affect your family's relationship with your child's teacher or the school. If a decision is made to participate, it will need to be made by 21st May for your child to be included in the project. Once a decision is made to participate, either you or your child can change your mind at any time.

As the project will take place during normal class time, the teacher will arrange another activity for your child to complete if they decide not to take part.

Privacy and confidentiality

The privacy and confidentiality of participants is assured. Information that identifies anyone will be removed from the data collected. Names will not be recorded on the food diary or the questionnaire. I will provide each child with a code that will identify their name on a participant list that only I will see. If your child's answers to the questionnaire are concerning and indicate they may be at risk of poor mental health, I will contact you in writing. For this purpose, should you agree to your child participating in their project, please provide your address on the consent

form enclosed. Please be assured that I will not release your child's responses to the school. The data that I collect is then stored securely in a locked filing cabinet that only I can access. The data will be stored for a minimum period of 5 years, after which it will be destroyed.

Participant privacy and the confidentiality of information disclosed by participants, is assured except in circumstances that require reporting under the Department of Education and Training *Child Protection* policy, or where the research team is legally required to disclose that information.

The data will be used only for this project, and will not be used in any extended or future research without first obtaining explicit written consent from both you and your child.

It is intended that the findings of this study will be provide to the school and submitted to an academic journal for publication. A summary of the research findings may be requested on completion of the project. You can access this by contacting me on the details listed below. The findings from this research can be expected to become available in November 2010.

Research ethics approval

The research has been approved by The University of Notre Dame Human Rights Ethics Committee and has met the policy requirements of the Department of Education and Training.

All persons undertaking research activities on Department sites must complete a Confidential Declaration. Also, under the *Working with Children (Criminal Record Checking) Act 2004*, people undertaking research that involves contact with children must undergo a Working with Children Check. Evidence that these checks are current for each member of the research team has been provided to the Principal of Melville Senior High School.

If you would like to discuss any aspect of this study please contact me on the number provided below. If you wish to speak with an independent person about how the project is conducted please contact Lorraine Mayhew on 9433 0941 at The University of Notre Dame research office.

If you and your child are both willing for him/her to be involved, please complete the **Consent Form** on the following page. Your child is also asked to complete the Consent Form attached to his/her letter and return it to the school by **Friday 21st May**.

This project information letter is for you to keep.



THE UNIVERSITY OF
NOTRE DAME
A U S T R A L I A

CONSENT FORM FOR PARENTS

Extra Food Intake and Depressive Symptoms in Adolescents: Is there a relationship?

- I have read and understood the information letter about the project, or have had it explained to me in language I understand.
- I have taken up the invitation to ask any questions I may have had and am satisfied with the answers I received.
- I understand that participation in the project is entirely voluntarily.
- I am willing for my child to become involved in the project, as described.
- I have discussed with my child what it means to participate in this project. He/she has explicitly indicated a willingness to take part, as indicated by his/her completion of the child consent form.
- I understand that both my child and I are free to withdraw that participation at any time without affecting the family's relationship with my child's teacher or my child's school.
- I give permission for the contribution that my child makes to this research to be published in a journal, provided that my child or the school is not identified in any way.
- I understand that I can request a summary of findings after the research has been completed.

EXTRA FOOD INTAKE AND DEPRESSIVE SYMPTOMS IN ADOLESCENTS

Name of Child (printed):

Name of Parent/Carer (printed):

Signature of Parent:

Date: / /

Address: (in case I need to
contact you

Please ensure that your consent form and your child's consent form are returned together.

Appendix 4



28th June 2010

Dear *Parent*,

I am contacting you regarding a recent survey as part of my research study that examines if a relationship exists between extra food intake and depressive symptoms in adolescents. The Centre for Epidemiologic Studies Depression Scale (CES-D) has been used extensively in Australian school based situations with young people and is a valid and reliable screening tool.

While reviewing the completed surveys I noticed that *Insert student name* recorded some concerning responses. Although this may not indicate a health issue, I recommend you seek advice from your general practitioner.

Should you wish to discuss this further, please contact the school nurse, Jenny De Rossi, on 93300322 Monday – Wednesday.

Please be assured that this information will remain confidential to the researcher.

Thank you for supporting this research study.

Kind Regards

Elisabeth Bradshaw